UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, D.C. 20250

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OFFICE OF ADMINISTRATOR

June 6, 1972

Subject: Screwworm Suppression

To: H C Cox, Director, ENT

As you know, currently the program to prevent screwworm migration into Texas is ineffective. There is a great deal of speculation concerning the causes of failure. Although ENT has increased support for the research component, are we reasonably confident that this increased support will be adequate to ensure that ARS can soundly recommend remedial measures by the end of December 1972? We should be in a position to apply the most intensive suppressive measures when the population is at its lowest level.

I understand that there are a multitude of possible causes for the failure of the current program. Perhaps some of the suggested causes can be ruled out on the basis of a logical analysis. However, much experimental data from carefully designed experiments will be required to identify the actual causes. Unless you and your staff are reasonably confident that the causes of failure will be identified in time to take remedial measures for the next season, I urge you to consider the merits of sending Dr. R. C. Bushland without delay on a three month detail to Mission.

The screwworm program is our most visible and most important success story. If the screwworm program should fail in two successive seasons, then inadequately informed individuals will question whether nonchemical area-wide suppression programs have enduring merit.

Waldemar Klassen

Waldemar Klassen
Assistant to Deputy Administrator

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OFFICE OF ADMINISTRATOR

June 8, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: T. W. Edminster
Administrator, ARS

Dr. M. E. Meadows, director of the screwworm program at Mission, Texas, visited my office at Beltsville on June 5 to discuss the screwworm program. He was accompanied by Drs. Hourrigan, Williams and Ross. We had the opportunity to discuss various aspects of the program. The purpose of this memorandum is to advise you of our discussions and to offer certain comments and recommendations for action. The comments and recommendations are not necessarily based on my views alone, but are conditioned by the views of others in APHIS, and by Dr. Bushland and other members of the ARS research staff associated with the screwworm program.

The current program is in a critical situation for this year. The number of cases that have occurred thus far exceed by far the number that have occurred by this time in previous years since the program was fully implemented in 1963. We can offer several reasons for this, but may not have identified all of the reasons. I am of the strong opinion that the performance of the releasdd flies is not up to standard. At the same time there are no definite data to support this opinion. Other factors have undoubtedly contributed to the present situation. Among those are the following:

1. The weather last winter and this spring has been unusually favorable for winter survival and early buildup of the population in Mexico and in south Texas.

2. The number of sterile flies produced and liberated in the winter and spring months was below the number necessary to adequately suppress the populations last winter under the favorable circumstances in northern Mexico. The number was also far short of the number required this spring.

We have known for a number of years that the only security against substantial numbers of flies into Texas each spring is to greatly suppress populations in northern Mexico for a distance of about 200 miles. This stresses the importance of a strong attack on the populations in the winter.

3. The screwworm has a much better chance to increase in number now than in years previously and a greater suppression effort is now necessary. This is due to two or more reasons. Livestock growers have changed livestock management practices and do not practice animal surveillance as diligently as before so that far more than the usual number of susceptible hosts occur. The wild game herds, especially deer, are also larger and more generally distributed in screwworm areas. This is due in part to lower mortalities due to screwworms in recent years.

In view of such developments it seems urgent to increase the rate of screwworm releases throughout the year and especially during the winter and spring months. A decrease in fly production and release rates in the colder months when the natural populations are lowest is contrary to the best strategy for achieving maximum efficiency in the use of the sterile-male technique. The sterile-male technique is highly efficient when the pest exists at low density but highly inefficient when it exists at high density.

Recommendation No. 1. It is my recommendation that the screwworm program be funded annually at a level that will permit year-round fly production at an average rate of 200 million per week. The rate of production might vary with certain limits but should not be reduced in the winter and early spring.

Recommendation No. 2. Because weather and other factors that can influence screwworm abundance are of such vital importance and so unpredictable, it seems essential that a contingency fund be established at a level of about $1 million per year. This fund is to be drawn upon to meet emergency situations and as quickly as possible.

There is no other method of insect control that requires the same degree of flexibility and immediate action for efficient operations when the occasion demands, as does the sterile-insect technique. A delay of one generation in releasing flies to prevent incipient populations from establishing can mean the need for five to 10 times the number of sterile flies the next insect generation to have the same suppression effect. A contingency fund established to meet such need when the occasion demands is one of the most urgent requirements for a continuing program. The technical committee might be charged with the responsibility of making an appraisal of the need for contingency funds subject, of course, to the approval of the Administrators. But the usual budgetary delays and other procedures that must be followed to obtain emergency funds is not satisfactory for the screwworm program.

Recommendation No. 3. The adequacy of the 10-mile swath width for fly releases, which was adopted some years ago for economy reasons, has been questioned by many of us for several years. While this practice has given satisfactory results most years, there is reason to believe that under favorable screwworm conditions the swath interval is not the most efficient manner of fly distribution. Recent release and recapture data supplied by Dr. Meadows supports this view. Therefore, it is recommended that the release interval be reduced to five miles each week. The extra costs increase should be compensated by reduced fly production this season, if necessary, but this should be adopted as a standard practice in the future along with the higher fly production previously mentioned unless experimental data indicate the need for further changes in this method of release.

Recommendation No. 4. The native fly population is already so high in most of south Texas it will not be possible to suppress the population to a low level this fly season. The maximum benefit from flies available will be to use them where populations are low to prevent buildup and to establish an effective barrier to rapid spread and further buildup. While some releases throughout the area may be necessary, the major effort should be to contain the screwworm where there is still a chance of doing so.

Recommendation No. 5. In an earlier memorandum I strongly urged the establishment and maintenance of three separate fly strains which would provide the flies for release. Admittedly, this recommendation was based on judgment as the best procedure to follow until appropriate performance information could be obtained. I would like to reiterate this recommendation for immediate implementation. The type of strains to employ can best be determined by the research workers but consideration should be given to including the original Florida strain, a new strain established from the native flies now in Texas, and a third strain perhaps from Mexico. It is my view that these strains should be established and used as soon as production is adequate. However, after full production is achieved, the relative performance of the three strains should be evaluated in the field as quickly and as thoroughly as possible. Such evaluation should include survival time, rate of dispersion at distances up to five miles. If data indicate any one strain to be definitely inferior, it should be deleted or replaced. In addition, a special long-range dispersal experiment should be undertaken duplicating the test conducted in 1963 which established fly movement for more than 100 miles.

Recommendation No. 6. One of the most significant changes in fly handling procedures made since the start of the screwworm programs involves the chilling of flies to prevent excessive activity and possible exhaustion of their energy before they can be released. While the logic of this procedure seemed valid and laboratory observations did not indicate detrimental effects, we have no way of knowing the effect this might have on the performance of the males when released in the field. On the premise that the flies released during the past few years are not performing as well as they did initially, it seems important to make an immediate and major effort to compare the survival and dispersal of flies in the field when chilled and when not chilled before release. Along similar lines the value of feeding prior to release versus not feeding should be appropriately studied in the field.

Recommendation No. 7. In view of the need to appraise the performance of various screwworm strains under difficult field conditions and to investigate every conceivable way to obtain maximum performance of flies produced, it is recommended that both research and methods development activity be strengthened to undertake the investigations required and as soon as possible. Field studies are urgent. Certain laboratory studies such as the selection of the most aggressive flies, and other studies that might conceivably give the answer to current problems should be undertaken.

General comment: There is much at stake in a continuing successful screwworm program. Like so many new practices, it would be a catastrophe if it were necessary to revert back to the old methods. In the case of the screwworm, livestock producers would face an insurmountable problem if the sterility program should fail because of a combination of technical, budgetary reasons. Current livestock management practices favor screwworm abundance and labor to adequately inspect and treat animals will be costly and in short supply. The screwworm populations would unquestionably increase to such high levels that a real catastrophe would be the result. Moreover, the success of the joint USA-Mexico program is at stake. It is an urgent matter that needs to be given full attention.

E. F. Knipling

E. F. Knipling
Science Adviser, ARS
Room 205, National
Agricultural Library
Beltsville, Maryland

R. C. Bushland

D. Schmidt

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
Veterinary Services
Federal Center Building
Hyattsville, Maryland 20782

June 9, 1972

Subject: Highlights of Meeting on Screwworm Program Held in Dr. Knipling's Office--June 5, 1972

To: E. E. Saulmon
Acting Deputy Administrator

The following persons participated in this meeting: Dr. E. F. Knipling, Dr. J. L. Hourrigan, Dr. D. L. Williams, Dr. W. Ross, and Dr. M. E. Meadows. The following items were discussed and agreed upon by the participants in the meeting:

1. Dr. Knipling felt that the regularly appropriated operating funds for the screwworm program were insufficient and that approximately $2 million should be added to the annual budget to effectively operate the program. He also very strongly emphasized that the screwworm program should have its own contingency fund of $1 million to be used during emergency situations when serious screwworm problems exist such as occurred in 1968 and is occurring this year.

2. Take immediate steps to replace our present strain of flies with flies from at least three different strains from a new subcolony. One strain will be developed from the aggressive fly that has invaded Texas this year. The second strain will be the Florida one used to eradicate screwworms from the Southeastern United States and during the early years of eradication in the Southwestern United States. The third strain will be the most sexually aggressive Mexican strain that Mission, Texas, is colonizing. As these strains are now being developed from seed stock, the present production of flies will be phased out. Circumstantial evidence indicates that the present production strain is not performing as well as it should. It must be realized that it will take several months to accomplish this change.

3. The level of sterile fly release should remain high throughout the year with maximum production--200 million per week--during the winter but never dropping below 185 million per week at any time during the year.

4. Reduce the swath width from the 10-mile swath width presently being used to no more than a 5-mile swath width.

5. Dr. Knipling strongly recommended greatly increasing methods development studies both in the field and in the laboratory. He also stated that the Entomology Research Division needed to increase their screwworm research at Mission, Texas, and in the field.

6. During the present outbreak the first priority is to stop the spread of screwworms. The heaviest fly release will be in the northern and eastern periphery of the screwworm outbreak even if it means reducing the number of flies released in southern Texas. However, we must keep a token fly release in the southern Texas area.

7. Dr. Knipling reaffirmed his position on the thin film releasing of flies by staying at least 150 miles beyond the peripheral cases. It has been the policy of the program for the last few years to maintain a thin film of flies at least 100 miles north of the peripheral cases until the spread is so great that it is no longer feasible.

8. Hold pupae at 80°F. until 90 percent of the flies have emerged. If it becomes necessary to chill flies before they are released, do not lower their temperature below 65°F.

9. Strong consideration should be given to stopping the feeding of flies in boxes.

10. Reduce the loading rate from 2,000 to 1,500 flies per box.

11. Dr. Knipling advocated additional trapping studies with marked flies to determine their dispersal patterns. He also believes that we should repeat the trapping studies that were conducted in 1963 when we attempted to determine the maximum distance that an individual fly may migrate.

12. Each lot of sawdust used for pupation should be analyzed for possible harmful contaminates.

13. Planes should be kept at optimum temperatures for the flies even if it means installing air-conditioning equipment.

Program officials are committed to implementing these changes to the extent that funds and personnel may become available.

J. L. Hourrigan
Senior Staff Veterinarian
Sheep, Goat, Equine, and Ectoparasites

cc:
Dr. E. F. Knipling-ARS,Beltsville
Dr. J. L. Wilbur, APHIS-VS,Hyattsville
Dr. H. C. King, APHIS-VS,Hyattsville
Dr. C. H. Schmidt-ENT,Beltsville
Dr. M.M. Crystal, ENT,Mission, Texas

Screwworm folder

File June 14, 72

Subject: Screwworm Suppression

To: Waldemar Klassen
Assistant to Deputy Administrator

With regard to your letter of June 6, we are confident that from the standpoint of entomological research, answers to most of the potential contributing factors for this year's unsatisfactory control program will be available. Actually, there is every reason to believe that the "open" winter in northern Mexico and southern Texas, in combination with the low numbers of sterile flies released during the winter and spring, allowed the screwworm to build up in northern Mexico. By spring of 1972 budgetary limitations forced APHIS to reduce the barrier from a 300-mile depth to a 50-mile depth and thus offered little protection against Mexican populations of screwworms. Contingency funds were not released until cases were found in Texas. As you are no doubt aware, once an insect population gains momentum, there is little likelihood of satisfactory suppression beyond a holding action without a tremendous increase in the numbers of sterile flies released. This inability to maintain the release program at a high level is certainly one of the contributing factors. Money, of course, is a major answer to this element of the problem.

In regard to the several entomological components, we believe we have identified these potential trouble spots, including strain differences, sexual vitality, physical debilities due to rearing or handling, and distribution techniques. The entire staff has realigned their work programs to emphasize these immediate needs. In addition, Calvin Jones has been transferred to Mission to bolster the field staff. You will recall that our May 23 memo to you regarding the FY-73 Budget for Pest Management included a proposed increase to permit adding 4 SMY's for FY-74. Donald Hopkins has also been detailed to field studies on Vieques. The enclosed memo of May 26 (photocopy of Dr. Schmidt's to M. M. Crystal) regarding the realignment of screwworm research at Mission should be of interest.

Certainly Dr. Bushland's advice is always welcome and sought, but we do not think a short-term assignment is the answer. However, Dr. Schmidt has been considering the possibility of asking Dr. Bushland to assume

File

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Certainly Dr. Buchland's advice is always welcome and sought, but we do not think a short-term assignment is the answer. However, Dr. Schmidt has been considering the possibility of asking Dr. Buchland to assume

permanent charge of the entire screwworm research program in the event that the Mexico eradication project becomes a reality. He has unofficially contacted Dr. Bushland on this matter and Dr. Bushland has indicated he would be interested.

/S/
H C Cox, Director
Entomology Research Division

Enclosure

ARS:ENT:RAHoffman/mjb 6/13/72, Ext. 83-393

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H C Cox, Director
Entomology Research Division

Enclosure

ARS:ENT:RAHoffman/mjb 6/13/72, Ext. 83-393

JUN 20 1972

Wyglaus file

JUN 19 1972

Subject: Cooperative Work on Screwworms at Los Alamos Laboratory, USAEC

To: T. W. Edminster, Administrator

Through: H. Rex Thomas, Deputy Administrator
Plant Science and Entomology

One of the most difficult research problems presently confronting our research staff at Mission, Texas, has been the search for a specific screwworm attractant. Such an attractant is sorely needed by the screwworm suppression program. During this past year, several samples of promising materials developed and tested at Mission were sent to the Los Alamos laboratory for mass spectral analysis and interpretation of the spectra. We have been most pleased with the cooperation and would like to continue it if possible.

Mr. Greg Rohwer, APHIS, has informed us that a Master Agreement between USAEC and the USDA may be worked out in the next few weeks. If at all possible, we would like to have promising screwworm attractant fractions analyzed by the Los Alamos chemists on a pay-as-you-go basis. This is not to exceed $2,000 for FY 73 (one analyses plus interpretation costs about $80.00). This type of arrangement would be mutually beneficial and may provide a solution to this very complex problem of developing a specific screwworm attractant.

H C Cox, Director
Entomology Research Division

cc:
G. G. Rohwer, APHIS

bc:
E. A. Taylor
A. W. Cooper

Subject: Cooperative Work on Screwworms at Los Alamos Laboratory, USAEC

To: T. W. Kammer, Administrator

Through: H. Ben Thomas, Deputy Administrator
Plant Science and Entomology

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R C Cox, Director
Entomology Research Division

cc:
G. G. Rohwer, APHIS

bc:
E. A. Taylor
A. W. Cooper

Ed

June 19, 72

OK

Subject: Cooperative Work on Screwworms at Los Alamos Laboratory, USAEC

To: T. W. Edminster, Administrator

Through: H. Rex Thomas, Deputy Administrator
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/s/
H. C. Cox, Director
Entomology Research Division

cc:
G. G. Rohwer, APHIS

bc:
E. A. Taylor
A. W. Cooper

CHSchmidt:bw 6-16-72

Subject: Cooperative Work on Screwworm at Los Alamos Laboratory, USAEC

To: T. W. Dahlquist, Administrator

Through: E. Ken Thomas, Deputy Administrator
Plant Science and Entomology

One of the most difficult research problems presently confronting our research staff at Kingsville, Texas, has been the search for a specific screwworm attractant. Such an attractant is urgently needed by the screwworm suppression program. During this past year, several samples of promising materials developed and tested at Kingsville were sent to the Los Alamos laboratory for mass spectral analysis and interpretation of the spectra. We have been most pleased with the cooperation and would like to continue it if possible.

Mr. Greg Kolmer, APHIS, has informed us that a Master Agreement between USAEC and the USDA may be worked out in the next few weeks. If so, if possible, we would like to have providing screwworm attractant fractions analyzed by the Los Alamos chemists on a pay-as-you-go basis. This is not to exceed $2,000 for FY 73 (one analysis plus interpretation costs about $50.00). This type of arrangement would be mutually beneficial and may provide a solution to this very complex problem of developing a specific screwworm attractant.

R. E. Cox, Director
Entomology Research Division

cc:
G. G. Kolmer, APHIS

bc:
E. A. Taylor
A. W. Cooper

CHSchmidt:bw 6-16-72

Screwworm

June 1, 1972

Subject: Cooperative Work with the Los Alamos Scientific Laboratory

To: R. R. Grabbe, Chemist

Through: M. M. Crystal, In Charge
Mission, Texas

Thank you for sending us the material from the Los Alamos Scientific Laboratory. Since my last visit to Mission I have contacted both Dr. Hensley and Mr. Greg Rohwer of APHS. The latter informed me that they are now waiting for the latest proposals from the USAEC regarding cooperative work at Los Alamos. This should be forthcoming within the next two weeks. It was his belief that it would be better to go in for a package deal involving all the different USDA agencies than to go at it in a piece-meal fashion.

Our tentative plans are as follows. We will draft a letter to the Administrator informing him of our needs and that we would like to get your analyses done on a pay-as-you-go-basis. We would, however, stipulate an upper limit. I will try to keep you informed on this situation.

Claude H. Schmidt

Claude H. Schmidt, Chief
Insects Affecting Man and
Animals Research Branch

CHSchmidt/mjb

cc: R. O. Drummond

June 1, 1972

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To: R. R. Grabbe, Chemist

Through: M. M. Crystal, In Charge
Mission, Texas

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Claude H. Schmidt, Chief
Insects Affecting Man and
Animals Research Branch

CHSchmidt/mjb

cc: R. O. Drummond

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE May 5, 1972

TO John Flano
Rm. 126 Bldg N
Beltsville, Md.

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [x] FOR INFORMATION
- [ ] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS

Insects Affecting
Man & Animals

5-8-72

~~C.H.S.~~
~~R.A.H.~~
~~J.A.F.~~

FROM D.L. Williams
FCB, Hyattsville

GPO : 1964 OF—742-059

FORM **AD-514** (8-64)

PRE-PROPOSAL

Screwworm

Proposal for

IDENTIFICATION AND ATTRACTANT TECHNIQUES FOR *COCHLIOMYIA HOMINIVORAX*

To be performed under an interagency agreement between:

The U. S. Atomic Energy Commission-Division of Biology and Medicine

and

The U. S. Department of Agriculture-National Animal Disease Laboratory (Diagnostic Services)

AEC Contractor: University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico

December 1971

SCOPE:

A one-year project is proposed to determine the feasibility of different methods for identifying plant-produced screwworm flies that have been collected in traps in the field and to investigate methods of improving attraction and collection of screwworm flies. The work will be directed along three lines: (1) tagging and identification of plant-produced flies; (2) electronic sensing and analysis of sound signals; and (3) isolation and identification of attractants. Non-radioactive materials will be fed to the plant-produced flies, and these will be identified by activation analysis methods. For the sound sensing, different species of flies will be monitored to see if there are any characteristic sounds of feeding, mating, flying, or larval feeding that could be used to attract or sort screwworm flies. If suitable tags can be found for identifying plant-produced flies and improvements realized in efficiency of trapping, then it will be much easier to evaluate and improve the effectiveness of the screwworm fly eradication program.

BACKGROUND:

Screwworms are the larvae (maggots) of the fly *Cochliomyia hominivorax*. They are true parasites, feeding only on the living flesh of warm-blooded animals. Infested, untreated animals may die. In the spring of 1962, a program was started to eradicate screwworms from Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. This was a much more complex and difficult undertaking than the elimination of the pest from the Southeastern states. In the Southeast, screwworms usually were able to survive through the winter only in peninsular Florida. Water on three sides and cold weather on the north acted as effective barriers.

The Southwestern states have no such advantages. The screwworm population in the Republic of Mexico provides a constant threat of reinfestation. It was estimated that screwworms caused an average annual loss of $100 million to the livestock industry before the beginning of the screwworm eradication program. The cost of eradication and subsequent maintenance of a sterile screwworm fly barrier has been about $6 million a year.

While the screwworm irradiation program has been very effective in reducing the number of cases of screwworm fly infections, it has been difficult to obtain data on the dynamics of the program so that improvements in techniques can be generated and evaluated. One of the major sources of information is obtained by setting up fly traps at strategic locations and counting the number of screwworm flies trapped and from this number determining how many were plant-produced screwworm flies. Present techniques involve hand-sorting trapped flies into screwworm and non-screwworm types. Screwworm flies are further analyzed by crushing and extracting a dye with acetone to see which were plant-produced. Hand-sorting of flies is both difficult and time-consuming, and very few screwworm flies are trapped by current methods. Thus, improvements in attraction, collection, and tagging of the flies are needed. Effective methods of attraction, collection, and sorting for more efficient utilization of those now produced, resulting in continued analysis of data for program evaluation, could provide meaningful economic impact on the program in a very short time frame.

Preliminary experiments at the Los Alamos Scientific Laboratory indicate that plant-produced flies contain no detectable bromine activity when examined by neutron activation and X-ray fluorescent methods, whereas all wild flies examined in these experiments showed high bromine contents. A less dramatic but yet significant finding was in the amount of manganese activity seen in the

respective groups. All plant-produced screwworm flies had considerably less manganese than wild flies. It is suspected that bromine originates from tetraethyl lead in gasoline combustion as an atmospheric pollutant and that wild flies somehow concentrate this either within the body or on the body surfaces. These experiments suggest that bromine-like elements such as iodine could be incorporated on or in the flies, as the case may be, to serve as a specific tag for plant-produced flies.

The general problem of attracting and sorting wild screwworm flies is not as clearly defined as the problem of identifying plant-produced flies. It is known that both sound and olfactory signals are used by insects as attractants and navigational aids, and these might be suitable for increasing the collection efficiency of the traps. Since it is possible that sound might be a useful stimulant or signature, it should be looked into by both a literature search and a laboratory experimental survey of sounds emitted by the flies. Personnel at LASL have extensive experience in electronics circuitry, sound ranging, and wave form analysis that will be germane for the acpustic investigations. In the area of identification of chemical attractants, LASL has considerable experience that can be brought to bear. Our scientists have already determined by X-ray diffraction the crystal structure of 9-keto-trans-2-decenoic acid, the pheremone of the honeybee, and have done preliminary work on a synthetic attractant for the Mediterranean fruit fly. Other biological molecules worked on are ATP (adenosine triphosphate) and some steroids in collaboration with a group at Cambridge University. Other possible projects have been discussed with Dr. Morton Boroza of the Department of Agriculture at Beltsville, Maryland. Dr. Boroza has done much work on the isolation and characterization of insect attractants.

LASL facilities include flame ionization and thermal conductivity detection,

analytical gas chromatography, and medium- and large-scale preparative gas chromatography. This equipment could be used for fractionation of mixtures and collection of working quantities of specific compounds. Excellent thin-layer chromatography (TLC) facilities are also available, including direct dual-beam photometry under both visible and ultraviolet light. Inlets for pyrolysis and pyrolysis-hydrogenation are available for use with gas chromatography to aid in structure determinations. LASL also has elemental and thermal analysis and optical, microscopic, and X-ray equipment.

Chromatographic fractions identified by USDA as having attractant properties can be identified by a combination of techniques [e.g., mass spectrometry (using a CEC 21-110 high-resolution spectrometer), nuclear magnetic resonance spectrometry (nmr), and ultraviolet-visible-infrared spectrophotometry]. Group CNC-4 is capable of doing high-resolution proton nmr and ^{13}C nmr at the natural abundance of the isotope. The positions of double bonds can be determined by combined chemical and instrumental methods.

While these proposed experiments do not attempt to solve all important problems in this program, they will initiate the LASL personnel and promote thinking along new areas of research.

PROJECT TIME SCHEDULE:

The one-year running time of the project is proposed so that adequate time will be available from conclusion of one experiment to start of another. It is expected that any of the experiments can be conducted throughout the year so that it is not necessary to wait for summer. Since this proposal is a group of feasibility studies, it is important that feedback from one experiment be incorporated in the next. However, activation, acoustic, and attractant experiments

can be done concurrently. The one-year time scale also makes it easier to fit these experiments in with priority requirements of established LASL commitments.

THE PROPOSAL:

The Los Alamos Scientific Laboratory recommends to the Division of Biology and Medicine of the United States Atomic Energy Commission (AEC) that the existing interagency cooperative agreement between the AEC and USDA be extended for the purpose of investigating methods for evaluating and improving the screwworm fly eradication program. Improvements would be sought in identification of plant-produced screwworm flies and in methods of attracting and sorting all screwworm flies in the presence of other flies. The project would extend over a one-year period and would involve active cooperation between the USDA and LASL. The USDA would assign a project officer at the USDA Mission, Texas, facility to provide cooperative support for the project. In particular, the USDA through the existing liaison office at LASL would:

(1) supply the necessary insects.

(2) supply the attractants.

(3) assist in conducting the atmospheric tests.

(4) supply traps and cages.

(5) provide knowledgeable technical assistance within their expertise.

The LASL would:

(1) suggest appropriate non-radioactive tagging materials for incorporation into the flies after consultation with USDA entomologists.

(2) examine the flies for the tagging materials.

(3) conduct experiments to determine the dynamics of uptake of the tag.

(4) investigate different methods for detecting tagged flies.

(5) investigate methods of identification of attractants.

(6) investigate the use of sound in attraction and sorting.

The first phase of the identification experiments will be to determine the relative abundance of all detectable natural elements and the site of bromine incorporation on wild flies (that is, to decide whether bromine is a surface absorption or if it is in the cuticle or interior body of the fly). It is advisable to obtain this information so that we can determine the proper induction mode of iodine to the fly. Concurrent with this investigation will be determination of the time-history of uptake of bromine to see at what rates it is normally acquired in the field. This will assist in the programming of iodine incorporation. Similar information on manganese uptake would also be obtained. The second phase of these experiments will be to investigate different methods of incorporating iodine into the fly, and a third set of experiments would be designed to find other tag elements that might be better for identification.

For acoustic experiments, live groups of flies would be placed in an anechoic chamber and recordings made of the flying sound. The different species of flies would be compared to see if there is a characteristic difference perhaps due to morphology of the wings. In the course of these experiments, sounds of feeding, mating, etc., would be looked for, and if any promising results were obtained these would be investigated sufficiently to see if additional work is justifiable. These acoustic experiments would be conducted in three frequency domains that are determined by the equipment needs. The first domain would include frequencies in the audio range up to 18 Khz. It would be done with the existing equipment and

Kilocycles (old nomenclature)
these freq. are below biomedical temp

construction of a small anechoic chamber. A literature search would be performed concurrently with this work. The second domain would extend the frequency range up to 40 KHz and would require modest equipment acquisition and incorporation of additional equipment on hand such as a fast tape recorder and use of a small computer. The third domain would involve extending the bandwidth up to 250 KHz, which is the maximum that has been reported in the literature. The last phase of the work would require more time to acquire and set up equipment than the first two.

For the attractant studies, we propose to start with materials furnished by USDA that are known to contain attractants. Both the attractant(s) produced in bovine blood and the sex attractant could be studied. Some considerable advantage should accrue from a primary emphasis on a study of the sex attractant because its identification would allow the trapping of specific flies. The enriched materials would be purified by use of chromatography, and identifications would be made by applying nuclear magnetic resonance, mass spectroscopy, X-ray crystallography, and any other methods deemed desirable.

If these preliminary experiments are successful, then additional proposals would be generated to cover subsequent work in those areas.

MANPOWER AND COST ESTIMATES:

Since this proposal involves different aspects and efforts by different divisions, these efforts are separated into manpower and cost estimates.

MANPOWER AND COST ESTIMATES

X-Ray Fluorescence Studies		
1 Staff member (half time), Group A-1	$27,000	(expense)
1 Technician (full time), Group A-1	29,000	(expense)
200 hours accelerator time at $50/hr	10,000	(expense)
X-ray detector	2,500	(expense)
Liquid nitrogen dewar for X-ray detector	1,000	(capital equipment)
Amplifier system for detector	1,000	(capital equipment)
	70,500	
Neutron Activation Studies		
1 Staff member (quarter time), Group CNC-11	18,000	(expense)
	18,000	
Molecular Structure Studies		
Chromatographic and nmr studies in Groups GMX-2 and CNC-4		
1 Staff member (quarter time)	13,000	(expense)
X-ray diffraction studies in Group CMB-5		
1 Staff member (full time)	39,000	(expense)
Computer time	5,000	(expense)
Low-temperature equipment	10,000	(capital equipment)
	67,000	
Biological Monitoring of Project		
Entomologist consultant	2,000	(expense)
Pathologist (0.1 staff member year), Group H-4	4,000	(expense)
	6,000	
Sound Experiments		
Audio frequency domain (1.5 ceiling points, quarter time)		
18-40 KHz domain (1.5 ceiling points, quarter time)		
40-250 KHz domain (1.0 ceiling point, full time)	75,000	(expense)
Microphone and tape head	1,000	(expense)
Equipment	10,000	(capital equipment)
	86,000	
GRAND TOTAL		$247,500

USDA

Associate scientist (0.1 staff member year)

USDA - ARS
RECEIVED
JUN 29 1972
FARGO, N. DAK.
M & R RES. LAB.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, D.C. 20250

OFFICE OF ADMINISTRATOR

June 28, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: R. C. Bushland, Director, M&RRL, ENT, ARS, USDA
Fargo, North Dakota
R. O. Drummond, Investigations Leader, IAM&ARB, ENT, ARS, USDA, Kerrville, Texas

Reference is made to Dr. Knipling's subject memorandum to Mr. T. W. Edminster of June 8, 1972, a copy of which is enclosed. Mr. Edminster has asked us to consider "What steps ARS should be taking in providing further assistance on this."

I should be grateful if you would study those recommendations which relate to research and the perfection of methodology. Please comment in detail on the manner and the feasibility of carrying out each of these recommendations in time for the next fly season. In addition, I believe Mr. Edminster would appreciate knowing whether you are reasonably confident that our research efforts will lead to the implementation of adequate corrective measures in time for the next fly season.

Waldemar Klassen

Waldemar Klassen
Assistant to Deputy Administrator

Enclosure

SCREWWORM ERADICATION PROGRAM

Mission, Texas

Summary of Proceedings of Staff Conference

June 29, 1972 8:40 A.M.

Present:

Dr. M. E. Meadows, Jr.	Mr. M. E. Fossum	Mr. V. M. Blackwelder
Dr. M. M. Crystal	Mr. A. J. Graham	Mr. Ray Carr
Dr. James E. Novy	Mr. W. H. Sudlow	Mr. Ken Lattimore
Dr. David Anderson	Mr. Calvin Jones	Mr. Gene Hammond
Mr. C. L. Smith	Mr. J. H. Smithey	Mr. Robert Hull

Dr. Meadows stated this will be a brief meeting, but perhaps there are items to be discussed that need decisions. We are ending the fiscal year with production at some 200 million per week and no scheduled reduction in sight, and we only have enough money budgeted to raise 130-140 million per week. This is a situation that is not to our liking, but here it is.

FLY PRODUCTION

Mr. Smith reported no big production problems. Dr. Meadows mentioned during a SOW inspection a day or so ago, he noticed that about a third of the eggs being laid in the fly colony were deposited on the metal edge of the vats instead of the wooden part and he asked about it.

Bill Sudlow explained that when these egging trays were built, we were able to get rubber type sponge that completely filled the egging trays but this is no longer available. We cannot get a product of that thickness. The egging vats approximate a wound in a living animal, the wet sponge being the actual wound, and the wooden rim the edge where we would like for the flies to deposit their eggs. A large percentage of the flies apparently misjudge this and deposit their eggs on the metal surface that protrudes above the sponge. These eggs will not hatch properly because they get too hot from contact with this metal, so they are not used for seeding vats unless we run short otherwise and have to use them.

Mr. Smithey said his sheet metal man started this morning modifying these egging vats, but it will take awhile. It would be simpler just to make new vats except that we do not have the material and we're striving to be economical.

One other thing - Mr. Sudlow said they have been losing a good portion of the blood they are hauling from Laredo and Brownsville because of spoilage since the weather has been so hot. They plan to try icing it down to see if this will help, but they may need to figure out something else if this doesn't work.

Mr. Smithey suggested insulating the back of the pickup partially with some styrofoam they have and then putting ice in with the blood cans; also suggested putting one of the refrigerated boxes in the back of the pickup - the ones like they are rigging up to haul flies from packaging to the planes for loading. He felt sure they could work out some method to haul the blood in good shape.

Dr. Meadows brought up the safety factor on these coolers and the fact that they are top heavy and could tip over very easily unless they are driven carefully. Mr. Smithey said he and Dr. Anderson have discussed this and all personnel operating these units will be warned and given instructions in operating these wheeled 'boxes'. They should not be operated more than five miles per hour. (This has reference to the refer boxes to be used on the ramp loading planes.)

AIRCRAFT MAINTENANCE

Gene Hammond said they have developed a new chute for the Cessna 310 at Douglas and are sending him a copy of the drawings so they can build one for trial here. The other one they tested was too short and the boxes exploded when they went out but the reports on this version are satisfactory.

FIELD OPERATIONS

Dr. Anderson expressed some concern about the temperatures in the holding rooms - they are holding them at 65° but in checking some of the boxes he has found as many as 50 flies in a box with some wing damage. Also, Dr. Grabbe has been running checks in various locations within the airplanes in flight. He has gone on several flights with instruments to check inside box temperature and Calvin Jones (both from ENT) is working on this too. One of the big problems, especially as some of the up-state distribution points, is that the planes are very hot when the second load is loaded and they are not able to get high enough to cool them down. They get hot and stay hot - as much as 100° inside the aircraft at times.

Dr. Meadows said one answer to this would be to have the first load take off at daylight so that it can be back and loaded for the second flight before it gets so hot in the middle of the day. Temperatures in central Texas have been above 100° for the past two weeks almost every day. Although it has been hot here, it hasn't been that hot.

Dr. Meadows said he reported to Dr. Saulmon a week or so ago that the minute we have funds after the first of the fiscal year we are going forward with plans for a cooled loading shed which also should alleviate this condition somewhat. Is this correct? Joe Smithey said it is - he and Dr. Anderson are working this out right now. Also, the mobile refrigerated boxes for use on the ramp are about ready to be tested. One is finished.

ADMINISTRATION

Mr. Fossum reported an extra $100,000 has been added to our funds to see us through the end of the fiscal year.

MAINTENANCE

Mr. Smithey reported eight of the twelve 7.5 Ton refrigeration units from excess in Pennsylvania were shipped June 20 by motor express. They added two 2-Ton refer units to the colony room and it is cooling pretty good - in fact, one area was too cool. They are modifying the egging vats to conform to the new sponge material - discussed earlier in this meeting. The sewer plant is clogged with bone - less than two weeks after they finished cleaning it out. They have installed a by-pass valve which they are going to try, using the lagoons and treating them. This was discussed with Mr. Husman, Dr. Williams, and others some time ago.

The old methods development area in the plant is cleared out so that it can be modified for the new sub-colony. They have a bid on 1½" styrofoam to insulate the exterior walls (on the inside) in the colony and it will cost for labor and material about $1,000 if it is decided to do it this way. This is cheaper he believes than the spray-on type of insulation. Work is progressing on the refrigerated trailers to be used on the ramp for loading airplanes. They will have dividers in them and should hold a little more than one Beechcraft load of flies. Dr. Anderson will be testing one soon to see if it is satisfactory.

METHODS DEVELOPMENT

Jack Graham said the Puerto Rican strain has not laid very well so far. This may make it necessary to change the time of the flight of the Air Force plane. They should egg about the 9th or 10th of July and this would give flies on the 19th or 20th. If we are lucky, it might hit on a Wednesday and be on schedule. Also, he believes there will be enough pupae to insure flies for the following week also.

Two of the Texas strains they are rearing show promise, but the Tamaulipas strain seems to have many traits that we do not want - they are slow to egg, do not live long, they are reluctant to mate, etc. The strain from Callaghan Ranch are laying exceptionally good for laboratory rearing. He then mentioned the rather detailed mating tests they have just concluded (reported fully in weekly report for week ending June 25). This test was designed to show the daily rate of mating for normal flies in comparison with irradiated males with normal flies.

Beginning on the third day and daily thereafter through the sixth day, normal males were removed from the normal females.

On the other half of the test, irradiated males were removed daily and normal males added at the same time. Each cage was stocked with 60 males and 60 females. The results showed that normal females caged with normal males had completed mating by the end of the third day. Since mating seldom takes place before the flies are 48 hours old, this means that all the flies had mated between the second and third day of age. Approximately 94 percent of the egg masses showed complete hatch.

The results from the other half of the test were interesting. The cage that had irradiated males with normal females from 0-7 days never did receive any normal males. There was near complete sterility with only one egg hatching from an estimated 15,300 and there was no visible spine development. All the other cages which had the irradiated males removed daily 3rd through the 6th day and normal males added showed greater hatch. It could be concluded that some of the females mated a second time when the normal males were added- however, Jack said this is very hard to prove. Several people commented this bears out suspicions they have had that multiple mating may be common with some screwworm flies. Calvin Jones said he had always had doubts about the one-time-mating theory and Al Baumhover expressed this same thought years ago.

Dr. Crystal, when asked, said he believes this was a conclusion made in the early days of research and was drawn from close observations made by Drs. Knipling and Bushland. Dr. Meadows questioned the possibility that the biology of the fly may have been changed by something we are doing. General feeling on this was that this trait may always have been present in some screwworm flies but we are just now noticing it.

Mr. Graham reported 55 total egg masses from Texas sources - 11 sterile, overall. This would be about 20% sterility.

ENTOMOLOGY RESEARCH

Dr. Crystal said he had nothing particularly to add. They did have a meeting on Friday to correlate the tests they are doing to solve some of the problems discussed. He asked Calvin Jones to comment on this. Calvin said he is still groping for a starting place and would welcome suggestions. He is most concerned with the well-being of the fly while it is emerging - number in the box, temperature, et cetera. Dr. Grabbe is on leave but to hasten this research, a meeting was called for Friday to align methods development and entomology research projects on a priority basis.

Dr. Meadows asked for additional comments; Joe Smithey said for the record, he would like to say he needs some more people. All the projects discussed are going to take skilled workers - the ones he has are spread very thin.

Meeting Adjourned 9:30 A.M.

June 30, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: Waldemar Klassen, Assistant to Deputy Administrator
Plant Science and Entomology Research, ARS, USDA
Office of the Administrator
Washington, D. C. 20250

I have your memorandum of June 28 asking for my comments on Dr. Knipling's memorandum of June 8 to Mr. Edminister.

Since Dr. Knipling and I discussed the screwworm problem over the telephone shortly before he wrote the memorandum and we also talked about it when I was in Beltsville in May, we were in general agreement, as he indicated in the opening paragraph of his memorandum.

However, there is a possibility of genetic difficulty that Dr. Knipling did not bring up that I discussed at the Mission conference on May 23. This is the chance that the wild fly population in northern Mexico and Texas may have developed a sort of genetic resistance to control by the sterile male technique. At that general conference I said that I thought the most likely reason for our current trouble is that something is wrong with the sterile fly now being released. However, there is the possibility that the native fly population could have been genetically selected for changed breeding habits which would make even "good" sterile males less effective. It should be recognized that from 1963 until this year we have been treating a northern Mexican fly population in a manner that would encourage the development of genetic resistance to control by sterile males.

1. MONOGAMY -- Insect behaviorists have proposed that the monogamous behavior of females is an evolutionary development. Ancestrally female insects were as promiscuous as the males, but when monogamy arose, it had survival value for two reasons. One is that when a female got a lifetime supply of sperm at one mating and refused to remate subsequently, the males were forced to seek out all the receptive virgin females in a population, and this insured insemmination of all the females, whereas indiscriminate, random, repeated matings would cause sperm to be wasted on some insemminated females while

some virgins were unfertilized. The second point is that if through mutation a male developed some sort of antimating factor that he introduced along with his sperm, the female would avoid other males whose sperm might displace those of the first mate. Thus, injecting a frigidity chemical assured that male that his gametes would fertilize the eggs and he would have better reproductive success. This recent evolutionary development does not require that there be 100% monogamy in the females of an insect population. For example, house fly workers note that around 3% of normally mated female house flies will accept a second male. In Australia working with the sheep blowfly, Whitten and Taylor (1970 J. Econ. Entomol. 63: 269) found that from 1 to 5% of the females would mate a second time. They selected those females that mated twice, and in only 10 generations the incidence of polygamous females increased to 30%.

When we eradicated screwworms from Curacao, we overwhelmed the wild population and eliminated it within a few months. Florida eradication required less than two years. However, in the Southwest, we attained 100% control of the population within the U. S. boundaries and perhaps 99% control of the population in northern Mexico, but we stopped our effort south of the border and allowed this fringe population to reproduce under conditions of selection for polygamy for more than 100 generations over the last 9 years.

We know that initially in this wild population of screwworms there were no such proportions of polygamous females as the 3 to 5% observed with Musca domestica and Lucilia cuprina. Dr. Knipling's first observation 35 years ago was that females appeared to mate only once. Beginning about 25 years ago I made many personal observations and delegated others to subordinate scientists, and none of us saw real polygamy in screwworm females. It was noted but rarely that females might mate a second time if their first mating was with a very young, immature male or with an older male nearly spent by many previous matings. I always said that screwworm females were 100% monogamous if they received a full complement of sperm and accessory secretion. However, it could be that one female in 1000 was truly polygamous, not responding to complete insemination, and we never could have detected this by our laboratory techniques. If this were so, and 1/10 of 1% of the wild females in northern Mexico were promiscuous, we have maintained in our international holding operation just the sort of situation that would select for mating resistance in a manner analagous to the development of insecticide resistance in so many insects.

If this sort of thinghas developed, it would be easy to check in the laboratory. At the joint APHIS-ENT meeting in Mission on May 23, I suggested that our ENT staff at Mission check this out on the recently colonized Texas wild population. I do not know whether they have taken any action.

2. PREMATING DISPERSION - There is another possibility which does not involve a change in female monogamy. This concerns onset of sexual maturity and dispersion of wild flies before they are old enough to mate. One of our earliest concerns in the field trials of more than 20 years ago was whether the wild flies from a single infestation would disseminate widely enough before mating so that released sterile males in the immediate vicinity of wild females would outnumber their fertile brothers. For example, a typical infestation might involve a single egg mass which would produce 200 flies. If this infestation would be in the navel of a newborn animal that would die under a bush, 200 flies would emerge and expand their wings on that bush. If in the vicinity of the bush there were food, water, and resting places, the new generation of adults might spread over only an acre by the time they reached mating age. With a population of 200 flies in that acre, even though were were no other wild screwworm flies within miles, it would be impossible to outnumber in a restricted habitat native males by randomly releasing flies even at the rate of 2000 per square mile since in this one segment of the environment the wild fly density would be about 100 males and 100 females per acre.

We were greatly relieved in our field test of 20 years ago to find that the hypothetical situation was not the case but that the native males and females dispersed very widely in the two or three days before they were old enough to mate so that random releases of as few as 100 sterile males per square mile overwhelmed the wild population.

However, when we consider the screwworm population extending from the Gulf of Mexico to the Pacific Ocean as being only suppressed for 9 years and not eliminated, we are certainly selecting from millions of insects over a vast area for a unique mutation which would only require that the insects not be strong flyers before mating if the adults emerge in a favorable environment.

When I proposed this possibility at the APHIS-ENT meeting, I said that it would be a difficult condition to recognize in the laboratory but a real enough possibility to constitute a further reason for hurrying along with eradication in Mexico. (If some years from now such a situation should arise in a barrier zone on the Isthmus of Tehuantepec, the area would be small enough for intensive application of other controls such as insecticide spraying of livestock and use of baits and chemosterilants. So the problem would not be as serious then across a 120-mile barrier as it could be along a 1300-mile international border.)

3. SEXUAL MATURITY - A third possibility concerns neither the monogamous behavior of females nor the normal dispersal tendency of unmated flies but relates to time of sexual maturity. At room temperatures, screwworms do not mate during the first 48 hours of adult life. (To be sure of virgins in our experiments, we separate the sexes within 24 hours of emergence.) A few flies will mate at 48 hours to 72 hours, but usually they are 3, 4, or 5 days old. Since the males and females in nature have 2 days to disperse and get separated before the sexes are attracted to each other, we have the opportunity to intermix the sterile insects. However, if a mutation should arise where the males and females reach sexual maturity at 24 hours instead of 48 hours, they would have only half as much time to disperse. Probably they would have less time than that because the newly emerged insects spend some time expanding their wings and hardening their bodies, and I expect that 2-day-old flies are stronger flyers than day-old insects. If they have only half as long to get separated before reaching mating age, the population of wild flies within flight range of the emergence site should be more concentrated. Since the density of the fly population within the area of dispersal would vary with the square of the radius, many more flies would be needed to outnumber wild screwworms that reach sexual maturity early.

Whether or not the new strain of flies that has invaded Texas does mature more rapidly than the flies we worked with in prior years is a point easy to check in the laboratory. Therefore, I proposed at the Mission conference that the ENT laboratory check this point. I do not know whether they have acted on that suggestion.

If any of the three possibilities mentioned above have occurred to complicate the field situation, then the remedial measures proposed by Dr. Knipling will not suffice. However, as I said at the beginning, I think our problem is merely one of fly quality. Dr. Knipling's recommendations should again give us competitive flies.

As you know, I have been suggesting with increasing ardor over the past 2 years that the research emphasis at Mission be diverted from laboratory evaluation of chemosterilants and laboratory testing of attractiveness of decomposed animal products to field ecology, collection of new genetic stock material in the field, laboratory and field evaluation of potential new strains for sterilization in comparison with old strains, and new techniques in comparison with the old techniques which we initiated in the Texas program. Many changes in production and release procedures have been made without adequate proof that the innovations were improvements. Dr. Knipling has essentially proposed that we go back to the things that

worked in Florida and the early years of the Texas program. He also showed concern about the genetic composition of strains to be released and possible deterioration of strains through many generations of propagation in the unnatural environment of the laboratory. Some of his proposals deal with attempting to restore more natural conditions, such as a day-night cycle, even though this complicates mass rearing.

I believe that if all the experiments in ENT research at Mission would be to develop knowledge that can be applied by APHIS right now and during the next 12 months, we will be in a better position to help the eradication program.

R. C. Bushland
Director

cc: E. F. Knipling
H C Cox

cc to Schmidt with attachment 7-5-72

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
METABOLISM AND RADIATION RESEARCH LABORATORY
STATE UNIVERSITY STATION
FARGO, NORTH DAKOTA 58102

June 30, 1972

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2. PREMATING DISPERSION - There is another possibility which does not involve a change in female monogamy. This concerns onset of sexual maturity and dispersion of wild flies before they are old enough to mate. One of our earliest concerns in the field trials of more than 20 years ago was whether the wild flies from a single infestation would disseminate widely enough before mating so that released sterile males in the immediate vicinity of wild females would outnumber their fertile brothers. For example, a typical infestation might involve a single egg mass which would produce 200 flies. If this infestation would be in the navel of a newborn animal that would die under a bush, 200 flies would emerge and expand their wings on that bush. If in the vicinity of the bush there were food, water, and resting places, the new generation of adults might spread over only an acre by the time they reached mating age. With a population of 200 flies in that acre, even though were were no other wild screwworm flies within miles, it would be impossible to outnumber in a restricted habitat native males by randomly releasing flies even at the rate of 2000 per square mile since in this one segment of the environment the wild fly density would be about 100 males and 100 females per acre.

We were greatly relieved in our field test of 20 years ago to find that the hypothetical situation was not the case but that the native males and females dispersed very widely in the two or three days before they were old enough to mate so that random releases of as few as 100 sterile males per square mile overwhelmed the wild population.

However, when we consider the screwworm population extending from the Gulf of Mexico to the Pacific Ocean as being only suppressed for 9 years and not eliminated, we are certainly selecting from millions of insects over a vast area for a unique mutation which would only require that the insects not be strong flyers before mating if the adults emerge in a favorable environment.

When I proposed this possibility at the APHIS-ENT meeting, I said that it would be a difficult condition to recognize in the laboratory but a real enough possibility to constitute a further reason for hurrying along with eradication in Mexico. (If some years from now such a situation should arise in a barrier zone on the Isthmus of Tehuantepec, the area would be small enough for intensive application of other controls such as insecticide spraying of livestock and use of baits and chemosterilants. So the problem would not be as serious then across a 120-mile barrier as it could be along a 1300-mile international border.)

3. SEXUAL MATURITY - A third possibility concerns neither the monogamous behavior of females nor the normal dispersal tendency of unmated flies but relates to time of sexual maturity. At room temperatures, screwworms do not mate during the first 48 hours of adult life. (To be sure of virgins in our experiments, we separate the sexes within 24 hours of emergence.) A few flies will mate at 48 hours to 72 hours, but usually they are 3, 4, or 5 days old. Since the males and females in nature have 2 days to disperse and get separated before the sexes are attracted to each other, we have the opportunity to intermix the sterile insects. However, if a mutation should arise where the males and females reach sexual maturity at 24 hours instead of 48 hours, they would have only half as much time to disperse. Probably they would have less time than that because the newly emerged insects spend some time expanding their wings and hardening their bodies, and I expect that 2-day-old flies are stronger flyers than day-old insects. If they have only half as long to get separated before reaching mating age, the population of wild flies within flight range of the emergence site should be more concentrated. Since the density of the fly population within the area of dispersal would vary with the square of the radius, many more flies would be needed to outnumber wild screwworms that reach sexual maturity early.

Whether or not the new strain of flies that has invaded Texas does mature more rapidly than the flies we worked with in prior years is a point easy to check in the laboratory. Therefore, I proposed at the Mission conference that the ENT laboratory check this point. I do not know whether they have acted on that suggestion.

If any of the three possibilities mentioned above have occurred to complicate the field situation, then the remedial measures proposed by Dr. Knipling will not suffice. However, as I said at the beginning, I think our problem is merely one of fly quality. Dr. Knipling's recommendations should again give us competitive flies.

As you know, I have been suggesting with increasing ardor over the past 2 years that the research emphasis at Mission be diverted from laboratory evaluation of chemosterilants and laboratory testing of attractiveness of decomposed animal products to field ecology, collection of new genetic stock material in the field, laboratory and field evaluation of potential new strains for sterilization in comparison with old strains, and new techniques in comparison with the old techniques which we initiated in the Texas program. Many changes in production and release procedures have been made without adequate proof that the innovations were improvements. Dr. Knipling has essentially proposed that we go back to the things that

worked in Florida and the early years of the Texas program. He also showed concern about the genetic composition of strains to be released and possible deterioration of strains through many generations of propagation in the unnatural environment of the laboratory. Some of his proposals deal with attempting to restore more natural conditions, such as a day-night cycle, even though this complicates mass rearing.

I believe that if all the experiments in ENT research at Mission would be to develop knowledge that can be applied by APHIS right now and during the next 12 months, we will be in a better position to help the eradication program.

R. C. Bushland

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Director

cc: E. F. Knipling
H C Cox

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
METABOLISM AND RADIATION RESEARCH LABORATORY
STATE UNIVERSITY STATION
FARGO, NORTH DAKOTA 58102

June 30, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: Waldemar Klassen, Assistant to Deputy Administrator
Plant Science and Entomology Research, ARS, USDA
Office of the Administrator
Washington, D. C. 20250

I have your memorandum of June 28 asking for my comments on Dr. Knipling's memorandum of June 8 to Mr. Edminister.

Since Dr. Knipling and I discussed the screwworm problem over the telephone shortly before he wrote the memorandum and we also talked about it when I was in Beltsville in May, we were in general agreement, as he indicated in the opening paragraph of his memorandum.

However, there is a possibility of genetic difficulty that Dr. Knipling did not bring up that I discussed at the Mission conference on May 23. This is the chance that the wild fly population in northern Mexico and Texas may have developed a sort of genetic resistance to control by the sterile male technique. At that general conference I said that I thought the most likely reason for our current trouble is that something is wrong with the sterile fly now being released. However, there is the possibility that the native fly population could have been genetically selected for changed breeding habits which would make even "good" sterile males less effective. It should be recognized that from 1963 until this year we have been treating a northern Mexican fly population in a manner that would encourag the development of genetic resistance to control by sterile males.

1. MONOGAMY -- Insect behaviorists have proposed that the monogamous behavior of females is an evolutionary development. Ancestrally female insects were as promiscuous as the males, but when monogamy arose, it had survival value for two reasons. One is that when a female got a lifetime supply of sperm at one mating and refused to remate subsequently, the males were forced to seek out all the receptive virgin females in a population, and this insured insemination of all the females, whereas indiscriminate, random, repeated matings would cause sperm to be wasted on some insemminated females while

some virgins were unfertilized. The second point is that if through mutation a male developed some sort of antimating factor that he introduced along with his sperm, the female would avoid other males whose sperm might displace those of the first mate. Thus, injecting a frigidity chemical assured that male that his gametes would fertilize the eggs and he would have better reproductive success. This recent evolutionary development does not require that there be 100% monogamy in the females of an insect population. For example, house fly workers note that around 3% of normally mated female house flies will accept a second male. In Australia working with the sheep blowfly, Whitten and Taylor (1970 J. Econ. Entomol. 63: 269) found that from 1 to 5% of the females would mate a second time. They selected those females that mated twice, and in only 10 generations the incidence of polygamous females increased to 30%.

When we eradicated screwworms from Curacao, we overwhelmed the wild population and eliminated it within a few months. Florida eradication required less than two years. However, in the Southwest, we attained 100% control of the population within the U. S. boundaries and perhaps 99% control of the population in northern Mexico, but we stopped our effort south of the border and allowed this fringe population to reproduce under conditions of selection for polygamy for more than 100 generations over the last 9 years.

We know that initially in this wild population of screwworms there were no such proportions of polygamous females as the 3 to 5% observed with Musca domestica and Lucilia cuprina. Dr. Knipling's first observation 35 years ago was that females appeared to mate only once. Beginning about 25 years ago I made many personal observations and delegated others to subordinate scientists, and none of us saw real polygamy in screwworm females. It was noted but rarely that females might mate a second time if their first mating was with a very young, immature male or with an older male nearly spent by many previous matings. I always said that screwworm females were 100% monogamous if they received a full complement of sperm and accessory secretion. However, it could be that one female in 1000 was truly polygamous, not responding to complete insemmination, and we never could have detected this by our laboratory techniques. If this were so, and 1/10 of 1% of the wild females in northern Mexico were promiscuous, we have maintained in our international holding operation just the sort of situation that would select for mating resistance in a manner analagous to the development of insecticide resistance in so many insects.

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cc: E. F. Knipling
H C Cox

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~ENTOMOLOGY RESEARCH DIVISION~~
P. O. Box 232
KERRVILLE, TEXAS 78028

July 7, 1972

Subject: Comments on Implementation of Recommendations by Dr. Knipling

To: Waldemar Klassen
Assistant to Deputy Administrator
Office of Administrator
ARS, USDA
Washington, D. C. 20250

I have sent a copy of your memorandum of June 28, along with a copy of Dr. E. F. Knipling's memorandum of June 8 to Dr. T. W. Edminster, to Dr. M. M. Crystal, In Charge of the research on screwworms at Mission. I have asked him to comment on the implementation of the recommendations. Although I am not aware of the future of the relationship between the Kerrville laboratory (in the College Station Area) and the Mission laboratory (in the Weslaco Area), I would still like to comment on the implementation of Dr. Knipling's recommendations.

Dr. Knipling has asked for establishment and field testing of strains of screwworms from the United States, Mexico, and perhaps the old Florida strain. The key point in his Recommendation No. 5 is that the relative performance of the three strains should be evaluated in the field. The key point to his Recommendation No. 6 is that in the chilled-fly experiments, survival and dispersal of flies in the field should be determined. Dr. Knipling has stressed the need for field evaluation of screwworm flies, and this type of research should be undertaken as soon as possible at Mission.

I would refer you to an enclosed copy of a memorandum of May 26 from Dr. C. H. Schmidt to Dr. Crystal. Dr. Schmidt's memorandum was the result of a meeting we had at Mission on May 22 and 23. At that time, we established a reorientation of the research activities at the Mission laboratory. Basically, one-fourth of the research effort will be placed on laboratory studies of the biology of strains, development of new strains, and evaluation of the chilled-fly technique. This research is to be done by Dr. Crystal. The remainder of the entomologists on the staff -- Dr. R. R. Grabbe, Mr. G. W. Eddy, and Mr. C. M. Jones (recently transferred from Lincoln, Nebr., to Mission) -- will be detailed to do research in the field and in liaison with the Methods Development group of APHIS. The purpose of the liaison research is to determine facets of the rearing and distribution of screwworm flies that can be improved so that a competitive screwworm fly will be placed in the field with a minimum of exposure to detrimental factors in the process. This research involves handling of flies, larvae, and

pupae in the plant, radiation studies, handling of flies in transit to the field, and studies on methods of dispersion of flies. The field research will include studies on the native populations of screwworm flies, field evaluations of new strains, evaluations of attractants, and include responsibility for the cooperative work in Mexico. In our cooperative agreement, Ing. Hermenegildo Velasco conducts research in the field to evaluate attractants, to determine dispersal of strains of screwworm flies, and also he is responsible for collecting pupae of screwworms in Mexico so that additional genetic material can be added to the screwworm strains at Mission.

I concur with Dr. Knipling's Recommendation No. 7 that both methods development and research activities should be strengthened as soon as possible, and that field studies are urgent. We need to know what a screwworm does in nature and how well a fly raised at the Mission plant competes with a native fly in the environment. Research of this type has not been conducted for the past several years. The reasons for this have been many and varied, but basically they have been lack of field personnel and limited support and travel budgets for the Mission laboratory. Even though the research efforts of the Mission laboratory have been shifted to undertake field activities, I am pessimistic that enough data can be obtained with the present staff and support so that the eradication program can be placed on a firm footing of research knowledge. It would seem that a minimum amount of finances, such as 10% of the total budget for the eradication program, should be set aside for research and methods development. With the amount of research that could be supported by this money, I feel that the necessary data could be accumulated within one-two years to solve many of the problems that are apparent in the screwworm eradication program this year.

R O Drummond

R. O. Drummond
Location Leader
U. S. Livestock
Insect Laboratory
Southern Region

1 Enclosure

cc:
M. M. Crystal

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~ENTOMOLOGY RESEARCH BRANCH~~
P. O. Box 232
KERRVILLE, TEXAS 78028

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1 Enclosure

cc:
M. M. Crystal

Mr Taylor

JUL 19 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
METABOLISM AND RADIATION RESEARCH LABORATORY
STATE UNIVERSITY STATION
FARGO, NORTH DAKOTA 58102

July 17, 1972

Dr. Donald Williams, Chief Staff Officer
Screwworm Eradication, APHS, USDA
Federal Center Building
Hyattsville, Maryland 20782

Dear Dr. Williams:

I was absent from the laboratory last week; so only today did I see the Summary of Proceedings of Staff Conference from Mission, Texas, dated June 29. I was particularly interested in the report on Methods Development on pages 3 and 4 of that summary. It seems from those remarks that I did not make myself sufficiently clear when I spoke about research needs at the Mission conference on May 23.

On June 28, Dr. Klassen wrote me for advice, and I replied on June 30. Since my reply put into formal writing the three points I made in my informal remarks at your meeting on May 23, I am enclosing copies of the correspondence. Note that I made three points:

(1) Monogamy. I suggested that Entomology Research do laboratory tests with the recently collected strain of Texas flies to see whether or not this new population had been inadvertently selected through our program efforts so that females are no longer monogamous.

(2) Premating dispersion. I suggested that virgin wild flies may not disperse as widely as they did at the beginning of the program. This would be difficult for Entomology scientists to check without elaborate field trials; so I made no recommendation for immediate research on this point.

(3) Sexual maturity. I suggested that flies may mate at an earlier age than they used to. If so, they would not disperse as widely before mating and would hence be harder to overwhelm with sterile flies. I suggested that this would be easy for entomologists to check merely by leaving both sexes of normal flies of the new Texas population together and isolating females from the males when they are 1, 2, and 3 days old. Subsequent records on egg hatch when they are old enough to oviposit would tell whether the new Texas population mates earlier than flies used to. Some of the older laboratory strains could be similarly used as controls. It seems that Mr. Graham did not quite get my point because he checked 3-day-old flies but not younger ones.

Points 1 and 3 should be easy to establish, and I hope that either the Research entomologists or the Methods Development entomologists will try to evaluate the possibilities I mentioned last May.

I would like to caution also that in establishing new laboratory strains of flies that the progeny of at least 17 different egg masses collected from diverse locations should be used to start a strain in order to incorporate normal genetic variability in each new strain.

Sincerely yours,

R. C. Bushland
Director

cc with copy of Summary: W. Klassen
C. H. Schmidt

cc with copy of Summary and Klassen correspondence:
E. A. Taylor

cc with Klassen correspondence:
M. E. Meadows, Jr.
M. M. Crystal

E A Taylor

JUL 1 8 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
[redacted]
BELTSVILLE, MARYLAND 20705

National Program Staff

July 18, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: T. W. Edminster, Administrator

Through: H. O. Graumann, Acting Assistant Administrator
Plant and Entomological Sciences Staff

By means of a reference slip dated June 13, 1972, you transmitted a copy of Dr. Knipling's subject memorandum of June 8 with the following comment: "For your information and consideration as to what steps ARS should be taking in providing further assistance on this."

I sent copies of Dr. Knipling's subject memorandum to Drs. R. O. Drummond of Kerrville, Texas, and R. C. Bushland, Fargo, North Dakota, and copies of their responses are transmitted herewith.

Dr. Drummond indicates that the research program at Mission has been reoriented to obtain the kinds of data recommended by Dr. Knipling. One-fourth of the research effort focuses on the development and comparison of improved strains and of the effect of chilling flies for immobilization. These are laboratory studies. A considerable effort is under way to evaluate the effects of plant operations, adequacy of quality control techniques, and the improvement of chill technology. The remainder of the effort consists of field evaluation of new strains, studies of native populations, and evaluation of attractants. Dr. M. M. Crystal, In Charge at Mission, has been asked to comment on the progress of this reoriented program. In the meantime Dr. Schmidt informed me that a number of problems in plant operations have been detected and corrected such as loss of temperature control in holding rooms, etc. Evidently there has been a failure to pay close attention to details in handling the flies.

Dr. Bushland suggests the possibility that behavioral changes may have occurred not only in the laboratory strain but also in the wild population. Essentially Dr. Bushland suggests that the release of billions of sterile males over the past decade set up a powerful selective force on the native population. Through prolonged selection the native flies may have been changed so that they would tend not to interbreed even with "competitive" released flies. Dr. Bushland suggests how this could have occurred through a relaxation of female monogamy, a reduction in premating dispersion, and accelerated sexual maturation. All of these components can be checked out experimentally.

Both Drs. Drummond and Bushland are extremely anxious to have the appropriate studies initiated. Dr. Drummond appears to be pessimistic that sufficient data could be obtained to place the operational program on a firm footing in time for the next fly season even if the effort could be doubled. Therefore in the absence of a harsh winter or unusual fortune in our research program we may be faced with difficulties next year.

Waldemar Klassen

Waldemar Klassen
Acting Staff Specialist
Pest Management

2 Enclosures

cc:
A. W. Cooper
E. A. Taylor
L. S. Henderson
C. H. Hoffmann
E. F. Knipling

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~ENTOMOLOGY RESEARCH DIVISION~~
BELTSVILLE, MARYLAND 20705

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Acting Staff Specialist
Pest Management

2 Enclosures

cc:
A. W. Cooper
E. A. Taylor
L. S. Henderson
C. H. Hoffmann
E. F. Knipling

July 25, 1972

Subject: Screwworm Suppression Program

To: F. J. Mulhern
Administrator, APHIS

You should have a chance to read some of the background information that is being developed regarding the screwworm suppression problems.

We have made some positive program adjustment recommendations, including the transfer of Jones to Mission. The funding adjustments to permit rapid change in program are more difficult. As we readjust our budgetary allocations under the new organization over the next several months, we will be assessing this problem. Later this fall, Dr. Cooper, Deputy Administrator for the area involved, can then give us a clue to budgetary needs and we will jointly discuss these with you.

If you have comments, please let me know.

T. W. Edminster
Administrator

Enclosure

cc:
A. W. Cooper
W. Klassen

AUG 4 1972

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 8/4/72

TO

Mr. Taylor

Thrus 10:00 A.M.

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REMARKS I believe you should prepare status report, including recommendations, and forward to Dr. Cooper about the middle of October.

FROM

H C Cox

GPO : 1964 OF—742-059

FORM AD-514 (8-64)

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE: 8/4/72

TO: Mr. Taylor

- [ ] ACTION
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REMARKS: I believe you should prepare status report, including recommendations, and forward to Dr. Cooper about the middle of October.

FROM: H C Cox

AUG 4 1972

Eat

Screwworm Research Laboratory
P. O. Box 986
Mission, Texas 78572

August 1, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: Waldemar Klassen
Assistant to Deputy Administrator
Office of Administrator
ARS, USDA
Washington, D. C. 20250

Dr. Drummond has asked me to comment to you on Dr. Knipling's memorandum of June 18, 1972, to Mr. Edminister, on the above subject. Although I have asked the scientists of the Mission staff to furnish me with their written comments for inclusion, they have not yet done so.

Within the limits of personnel, research assignments have been reoriented so that we may be able to obtain solutions to the problems that gave rise to the present screwworm buildup in order to avoid the same pitfalls next season.

My personal thinking presently favors the concept that we were overwhelmed by a huge natural buildup of the screwworm population due to conducive weather conditions and that sterile flies were not released in sufficient numbers to counteract the buildup.

Intensive study of the performance of production flies is now underway in the laboratory. Unreplicated results from 2 of the several tests in progress with reference (Florida) females show that although the mating capacity of normal production males was surpassed by reference (Florida) males, the fertile production males were more competitive sexually than reference males and the sterile production males were nearly equally competitive with reference males.

The simultaneous mass production of 3 separate colonies (Florida, Texas, Mexico) is perhaps a desirable goal but one that cannot be attained for technical reasons. The physical plant and the floor personnel are such that there is no way of guaranteeing the integrity of the strains starting with the first generation. Three separate plants or sub-plants would be necessary to effect this recommendation.

Screwworm Research Laboratory
P. O. Box 986
Mission, Texas 78572

August 1, 1972

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Assistant to Deputy Administrator
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Comments and Recommendations Concerning the Screwworm Suppression Program

The Florida strain is available from Research whenever APHIS will request it. The Texas and Mexico strains are being developed from some collections already made and others in progress. These collections are being interbred in order to produce single strains of representative genetic variability. The nature of this procedure is such that a few months must elapse before it is completed.

The effects of chilling and nonfeeding of flies has been partly explored by Methods Development. In our laboratory, I am in the process of obtaining data on the effects of chilling by exposing flies to the temperatures and intervals actually used.

Strengthening the research staff for field work is critical since the answers to our questions are ultimately to be found in the field. I strongly urge the employment of at least 2 advanced-degree entomologists with supporting personnel and adequate funding.

Maxwell M. Crystal
Acting Location Leader

cc
E. A. Taylor
R. O. Drummond

Comments and Recommendations Concerning the Screwworm Suppression Program

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Maxwell M. Crystal
Acting Location Leader

cc
E. A. Taylor
R. O. Drummond

AUG 15 1972

E. A. Taylor
AUG 8 - 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~ENTOMOLOGY RESEARCH DIVISION~~
BELTSVILLE, MARYLAND 20705

August 8, 1972

Subject: Comments and Recommendations Concerning the Screwworm Suppression Program

To: M. M. Crystal, Acting Location Leader
Screwworm Research Laboratory
P. O. Box 986, Mission, Texas 78572

Thank you for your subject memo of August 1. I had an opportunity to discuss your memo with Dr. E. F. Knipling.

Dr. Knipling feels that you have misinterpreted his recommendation that three separate fly strains be established and maintained. Dr. Knipling believes that these should be brood colonies. Most of their eggs would be taken to the mass rearing plant and mixed together for mass production of the release strain. However, some of the eggs would be used to perpetuate each brood colony. Under ideal operating conditions, none of the eggs from the mass rearing plant would be used for propagation. The three brood colonies would be reared on a superior and perhaps more expensive diet than that used for mass production. Dr. Knipling did not wish to imply that each strain would be mass reared. The maintenance of three brood colonies should be feasible without remodeling the mass production plant. Indeed, Dr. Knipling believes that insects from any mass production facility should not be used for propagation. If a microbial or nutritional disease afflicts the mass culture, there should be no opportunity for it to affect the brood cultures.

Dr. Knipling also believes that the effect of chilling on the ability of the fly to disperse strongly should be investigated. He suspects that the chilling of pupae or pharate individuals may affect the development of the thoracic musculature. Your memorandum did not stipulate the types of tests which you are conducting with chilled flies. I hope that you will investigate the flight capabilities of flies that have been chilled.

In addition to these studies, I hope that your work on an attractant mixture will yield a trap that is useful for quantitative estimates of natural populations and for determining actual release ratios.

Waldemar Klassen

Waldemar Klassen
Acting Staff Specialist
Pest Management

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

AUG 15 1972

DATE 8/14/72

TO E. A. Taylor

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REMARKS Ed just knew you would be interested in the written report.

Regards

FROM C M Cooper

GPO : 1964 OF—742-059

FORM **AD-514** (8-64)

E. A. Taylor

Report

On Cows

E. A. Taylor

Subject: Trip Report to Screwworm Rearing Facility at Mission, Texas

To: Donald Miller
Acting Director
Programs Development and Application

Through: Donald R. Shepherd

From June 12 through 16 I visited the subject facility for the purpose of reviewing the Methods Development Section and to offer suggestions as to the course of work needed.

During my visit I toured the plant and talked with the leaders of various sections and with Mr. Gains Eddy, Entomology Research Division.

I found that methods development personnel were mainly engaged in quality control work and were doing very little development work. This is not meant as a reflection on the ability or motivation of the methods staff, since all are capable individuals, but I gathered that support for this section has waned during the years the plant has operated. In order to improve the methods work, support is needed in the form of adequate funding and the staff should be expanded to include an engineer or equipment specialist and at least two technicians. I feel, too, that a much better operation would result if the methods section would be organized as a semi-independent section reporting to and directly responsible to the Chief Staff Veterinarian in charge of screwworm eradication. This would insure a constant level of support not dependent upon the interest of the station leader, whose main function is supervising overall production and dispersal of flies. An effective methods development section must be energetically led and constantly involved in improving techniques. Quality control is an essential part of an established rearing operation, but actual development of techniques is a never-ending evolutionary process.

Some avenues of methods work that could be explored are the development of a collection and free release method of adult flies. This would eliminate a costly packaging procedure and possibly result in better fly dispersion. Work should be undertaken to improve the trapping system of released flies. Proper evaluation

of the habits of wild flies and those released in nature is impossible due to the lack of a method of trapping male flies. Emphasis should be placed on developing tests to find the source of attraction between male and female flies. This may be more of a research item than methods, but studies by methods should be conducted utilizing such things as infrared and sound traps. A study should be made of the effects of rearing flies under a photoperiod similar to that occurring in nature. The genetic integrity of artificially raised flies might be maintained by introduction of several strains into the main culture simultaneously. The agility of different strains of flies reared separately could be tested by running flight mill and other studies. Crowding tests should be made as crowding may impose a subtle influence on the behavior of the flies.

In talking with individuals it was generally agreed that the present culture of flies may be genetically inferior and unable to compete in the field. This could be rectified as mentioned above by the introduction of other strains.

The present high number of screwworm cases reported in the Southwest can partially be attributed to ideal climate conditions but other factors are bound to have played a role. In the rearing procedure all conditions should be carefully monitored by testing the components for pesticides on other harmful materials. Sawdust, syrup, and cotton should be specifically tested for pesticides on a regular basis. In fact, corncob grits or vermiculite may be a better pupation media than sawdust, which is hard to obtain.

I was told that through the years several people have been in charge of distributing flies over the release area and that each used different methods. A standardization of procedure would be desirable. I assume that the speed of the release airplanes and the altitude flown has been monitored to insure that the flies are not harmed.

To manipulate a species, its behavior must be known and lack of information on the release male creates a serious vacuum. I am sure that work has been done to determine what attracts the sex for mating. Most probably a pheromone is involved, but there may be a combination of factors. I have taken the liberty of sending some preserved flies to Dr. Phillip Callahan, United States Department of Agriculture, Attractants and Behavior Laboratory, Gainesville, Florida, who has agreed to scan and photograph the antenna through an electron microscope in hope of finding and recognizing signal receptors.

In conclusion I recommend that much more interest be given to both methods development and research activities. More qualified entomologists with applied research experience should be brought into the program. Any rearing program can become a victim of complacency if no serious problems arise for long periods of time. This must be guarded against.

/s/ C. L. Mangum

Charles L. Mangum
Head, Methods Development Section
Methods Development Branch

cc:
Dr. M. E. Meadows, APHIS, Mission, Texas
Dr. J. L. Hourrigan, APHIS, Hyattsville, Maryland
Dr. J. L. Wilbur, APHIS, Hyattsville, Maryland
Dr. D. L. Williams, APHIS, Hyattsville, Maryland

APHIS:PPQ:CLMangum:lg 6-26-72 ext. 8337

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Screwworm Research Laboratory
P. O. Box 986
Mission, Texas 78572

August 10, 1972

Subject: Report on Observations of APHIS Operations, May 30 to July 31, 1972

To: E. A. Taylor
Acting Area Director
Weslaco, Texas 78596

Through: M. M. Crystal

Holding Rooms for Irradiated Pupae and Flies

On May 30 the first inspection of the packaging holding rooms was made. Room No. 2&3 had areas of poor air circulation where the temperatures inside some cartons reached 97° compared to carton temperatures of 80° in areas of good air circulation. The carbon dioxide concentration was very high and as a result breathing was difficult and our eyes burned. We attempted to light matches in this atmosphere, but they would go out immediately after the head portion of the match was burned. At that time we did not have equipment to accurately measure CO_2 and O_2 concentrations.

On May 31 Room No. 10 had carton temperatures ranging from room temp. at 79° to 93° in areas of poor air circulation. Most racks contained 11 trays of 8 cartons each. The shelves in some racks were not used properly, and as many as 4 trays of cartons were stacked one upon another which caused decreased air circulation for all cartons between two trays and higher than normal temperatures. This situation was brought to Dr. Novy's attention and was immediately corrected.

Temperatures were recorded in cartons at 5 different heights on 4 different racks in Room No. 7 on June 1. The temp. ranges on each rack were 88-92°, 90-93°, 88-90°, and 82-84°. The top and bottom trays were the coolest. The room temp. was 80° in front of the air conditioner.

On June 5 temperatures were recorded in cartons held in the metal carriers in Room No. 2&3 and were found to range from 93° to 97° in the warmest of the carriers. The room temp. in front of the air conditioner was 86°.

The air temp. in Room No. 11 taken in two different locations at the same time differed by 10° even though the room was less than one-third filled with racks and carriers. Carton temperatures varied as much as 17°.

The cartons in the carriers are stacked 4 cartons long by 3 cartons deep by 2 cartons wide. The cartons have perforations on the top, bottom, front, and back. The arrangement of the cartons in the carriers severely restricts air exchange on 8 cartons of the 24 and limits air exchange on the others. Poorer air exchange leads to higher CO_2 and lower O_2 concentrations and higher humidity inside the cartons and poorer heat exchange with the environment.

Release Aircraft

Temperatures were recorded on June 6 on a C-47 release aircraft which carried 4,000 cartons in metal carriers (2,200 flies per carton, 24 cartons per metal carrier). All the carton temp. measured were at or below 83° except for 4 carriers of 24 cartons each which reached 93°. Those cartons were released within one hour of loading. The temp. in cartons decreased with time from 83° to as low as 55°. Many thousands of flies escaped into the fuselage during this time because many cartons crushed slightly which opened cracks of sufficient size so flies could crawl through. The flies on the floor were swept together and vacuumed out, and those on the walls were vacuumed out. The vacuum line leads to the exterior of the plane so the flies were released, but the handling may have been harmful to them. During this cleanup procedure, the disperser did not disperse cartons for several minutes.

On June 27 temp. were recorded in a C-45 which carries 1000 cartons. It was loaded about 11:20 a.m. in a hangar while an air conditioner pushed cool air through the fuselage. Temperatures ranged from 80-103° at 11:40, 74-90° at 11:50, 65-91° at 12:02, 57-81° at 12:16, and 55-77° at 1:00. We landed at Uvalde to pick up another 1000 boxes. The holding room was rapidly approaching outside temp. of 95° because the doors were left open while 2 other planes were being loaded and because 1 of the 2 air conditioners was not working. Our load of flies was hot from the beginning because of the holding room conditions, and because all the racks of cartons were rolled onto the runway before loading of the plane was begun. The cartons were at least as warm as the air temp. because of the wind, sun, and fly activity within the cartons. We were airborne as soon as possible. Temperature ranges were 99-105° at 3:23, 100-108° at 3:29, 101-108° at 3:31, 99-105° at 3:37, 88-103° at 3:50, and 81-99° at 4:00 when my last temp. probes were pulled out to allow spreading and dispersing the cartons.

General Conclusions

The screwworm rearing plant has 3 shifts of employees each day 7 days a week. Each shift currently produces about 10 million flies when the 200 million flies per week is averaged out over 21 shifts. Each age group (shift) of screwworms is treated as a single, uniform group from the time they pupate until the cartons are dispersed. Due to "hot spots" in the packaging holding rooms, the groups of about 10 million flies are not subjected to uniform conditions. The activity of the flies increases greatly as the temp rises from 80° to at least 105° as can be observed by listening to the intensity of the buzzing. As the activity increases, so does the respiration rate of the flies.

Increased fly activity produces effects including the following:

1. Increased CO_2 and decreased O_2 in the cartons.

2. Increased caloric output by the flies which increases the amount of heat needed to be exchanged by the air conditioners.

3. Decreased internal energy reserves for the flies, such as glycogen and fat because of increased respiration (unless the H_2O-syrup mixture adequately compensates for the energy consumed.

4. Higher humidity due to respired H_2O which causes weaker cartons due to the absorption of H_2O by the cardboard which allows the cartons to crush more easily and causes the problem of escaped flies on the release aircraft as noted above.

5. More wing damage to the flies because of increased wing beating and because of damage to unhardened wings by the activity of the other flies. The high temperatures recorded in some cartons on the release aircraft are not desirable because the amount of wing damage increases greatly when the flies buzz as actively as they did at those temperatures for those durations.

Research Plans

Some of the things we plan to do research on as soon as the proper equipment arrives are the ~~effects on~~ screwworm pupae, emerging flies, and young adults on

1. Holding temepratures from 80° to 115°.

2. High CO_2 concentrations.

3. Low O_2 concentrations.

4. High humidity.

5. Combinations of 1-4.

R. R. Grabbe
R. R. Grabbe
Research Chemist

John P. Turner
John P. Turner
Biological Technician Insects

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE SEP 5 1972

8-16-72

TO

R. C. Bushland

A. H. Baumhover

E. F. Knipling ✓

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REMARKS For your review and comment.

Mr Taylor:

This is a good study and should lead to improvements in conditions for flies. Am surprised at high temperatures which could at least survival and physical condition. EFK

Edgar A Taylor (ed)

FROM

E. A. Taylor

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 8-16-72

TO

R. C. Bushland

A. H. Baumhover

E. F. Knipling

Mr. Taylor

- [ ] ACTION
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RECEIVED AUG 21 1972 M & R RES. LAB.

REMARKS For your review and comment.

I discussed this with you over the phone of Friday. The questions are accurate but I think it was poor diplomacy to publicize APHIS findings so bluntly. Dr. Meadows received a copy from Mr. Taylor and was quite disturbed because he felt compelled to forward it through APHIS channels in Hyattsville.

Bush

FROM E. A. Taylor

GPO : 1964 OF—742-059

FORM AD-514 (8-64)

E A Taylor

AUG 15 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D.C. 20250

AUG 14 1972

Subject: Screwworm Suppression: Reinforcement of Supporting Research

To: A. W. Cooper

E. R. Glover

H. O. Graumann

For more than one year considerable difficulties have been experienced in preventing reinvasion of the Southwest by screwworms. The effort to eliminate the screwworm from the Island of Vieques did not succeed. More screwworms are now present in the United States than at any time since the program began.

Many reasons have been suggested for the failure of the program during the past year. Clearly, the weather has favored screwworm development. Nevertheless, there is a strong likelihood that other important factors are involved, so that a control failure may occur again next year, even if weather conditions are normal. Therefore, there is an urgent need to increase the research support of the screwworm program in order to place the program on a firm footing in time for the next fly season.

In order to augment the research program, the following actions will be taken:

1. Effective immediately, Dr. R. C. Bushland will serve as Acting Research Leader of the ARS research unit at Mission, Texas. Dr. Bushland will leave as soon as possible on detail to Mission, Texas. A personnel action is in preparation to make this a career assignment for Dr. Bushland. He will be directly responsible to Mr. E. A. Taylor, Area Director. Dr. Bushland will be responsible for setting research priorities, and for supervising and coordinating all pertinent research. His major responsibility will be to develop and execute a research program which is likely to lead to the implementation of fully adequate remedial measures in advance of the next fly season.

2. Dr. M. M. Crystal will make every effort to assist Dr. Bushland in the speedy development and initiation of this program.

3. Dr. H. O. Graham will leave as soon as possible on detail for 3-6 months to Mission, Texas. He will participate on a full-time basis in the research program developed under the leadership of Dr. Bushland.

4. At the discretion of Dr. Bushland, the following individuals will be detailed to Mission:

Mr. D. E. Hopkins, Kerrville, Texas

Mr. C. C. Dawkins, Kerrville, Texas

Mr. G. E. Spates, College Station, Texas

5. The National Program Staff will advise me on the need to support this augmented research program from the Administrator's Contingency Fund. In addition, the National Program Staff will keep me apprised of research progress and advise me if other measures are needed.

S/T. W. Edminster

cc:
J. R. Johnston
C. H. Schmidt
E. A. Taylor
R. C. Bushland
H. O. Graham
M. M. Crystal
R. O. Drummond
E. F. Knipling
H C Cox
R. A. Hoffmann

VMS 8/31/72

Kika Hails Screwworm Treaty

WASHINGTON (UPI) — Rep. Kika de la Garza, D-Tex., applauded a United States-Mexico cooperative agreement Wednesday as a serious attempt at ending the screwworm epidemic in the Lower Rio Grande Valley and northern Mexico.

The South Texas Congressman said the agreement is the culmination of an effort begun by Texas cattlemen through the Southwest Animal Health Research Commission in 1962. De la Garza said then Vice President Lyndon B. Johnson was responsible for funding the first screwworm erradication center at Mission, Tex.

The agreement, announced Tuesday by Agriculture Secretary Earl Butz, establishes a joint commission between the two countries with $40 million dollars committed to establishing a screwworm barrier at the Isthmus of Tehauntepec in Mexico.

De la Garza cited other problems facing the Lower Rio Grande Valley, such as the black citrus fly infestation and uncontrolled tributaries of the Rio Grande which have produced costly flooding in recent years.

He said a far reaching program aimed at wiping out the citrus fly could be instituted along the lines of the screwworm program. The uncontrolled pest could damage millions of citrus trees on which the valley dependent, he said.

"It is mandatory that there be a joint commission established to study these flood plains to forestall possibly disastrous flooding on both sides of the border," de la Garza said.

Flooding from Hurricane Beulah in 1967 and Hurricane Celia in 1970 amounted to hundreds of millions of dollars in damages.

To V. R. Marcley SEP 2 1972

Answer to telephone request from Washington Information Office to V. R. Marcley re: Q and A's to brief Vice President Agnew who will visit San Antonio and Fort Worth, Texas. Date of visit unknown at this time.

QUESTION: What is the U. S. Department of Agriculture doing about the increased incidence of outbreaks of screwworms in Texas and the Southwest?

ANSWER: We are quite concerned with this situation. Recently, the co-founder of the sterile-male technique, Dr. R. C. Bushland was reassigned from Fargo, N. Dak., to Mission, Texas, to bolster the screwworm control staff with his expertise.

This past season the weather, I understand, was ideal for increased outbreaks. Recently, a new cooperative program was initiated. This is between the Department of Agriculture and the Mexican Government. The agreement will allow agricultural experts--cooperating with Mexican experts-- to go into southern Mexico and attack the problem there at the source. Southern Mexico is where the screwworm fly overwinters. They will continue to use the sterile male release technique.

cc: AWCooper
HCCox
Dr. Johnston
RIFile

To V. R. Marcley 9/22/72 DE

Attend to telephone calls, from Washington information Office to
K. S. Morris yet a and d'e to write this Department down who will
start Sun Antonio and Fort Worth, Texas. Start at eight tomorrow at
this time.

MORRIS: What is the U. S. Department of Agriculture doing about
the increased incidence of outbreaks of screwworm in Texas and the
Southwest?

ADAMS: We are quite concerned with this situation. Recently, the
secretary of the Atomic-Energy Commission, Mr. E. C. Bernhard was
transferred from Fargo, N. Dak., to Atlanta, Texas, to initiate the screwworm
control start with his expertise.

This part season the weather, I understand, was ideal for increased
outbreaks. Recently, a new cooperative program was initiated. This is
between the Department of Agriculture and the Mexican Government. The
agreement will allow agricultural experts--comparable with Mexican
experts-- to go into southern Mexico and attack the problem there at
the source. Southern Mexico is where the screwworm fly overwinters.
They will continue to use the sterile male technique.

cc: Secretary
Byrne
Mr. Johnson
Elvira

MEMORANDUM OF CALL

JE 9

TO: Mr Taylor

☒ YOU WERE CALLED BY— ☐ YOU WERE VISITED BY—

Dr Hensley

OF (Organization)

☒ PLEASE CALL → PHONE NO. CODE/EXT.

☐ WILL CALL AGAIN ☐ IS WAITING TO SEE YOU

☐ RETURNED YOUR CALL ☐ WISHES AN APPOINTMENT

MESSAGE

505-667-4281
Los Alamos
New Mexico

RECEIVED BY	DATE	TIME
LD	9/21	11:35

STANDARD FORM 63
REVISED AUGUST 1967
GSA FPMR (41 CFR) 101-11.6

GPO : 1967—O-300-455 #7-h

63-108

MEMORANDUM OF CALL

TO:

☐ YOU WERE CALLED BY— ☐ YOU WERE VISITED BY—

OF (Organization)

☐ PLEASE CALL ⟶ PHONE NO. CODE/EXT.

☐ WILL CALL AGAIN ☐ IS WAITING TO SEE YOU

☐ RETURNED YOUR CALL ☐ WISHES AN APPOINTMENT

MESSAGE

RECEIVED BY | DATE | TIME

STANDARD FORM 63
REVISED AUGUST 1967
GSA FPMR (41 CFR) 101-11.6

5010-108 GPO 1967—O-300-201 (17-1)

RCBushland/JE 9/29/72

Screwworm

Items of Possible Interest to the Secretary:

ARS Research facilities may have further increased responsibilities in screwworm investigations because of a case reported in Florida on September 29.

The State Veterinarian of Florida advised Dr. M. E. Meadows of the APHIS facility at Mission, Texas that screwworms had been found in a native cow near Sibrin, Florida. APHIS officials will release 1,600,000 sterile flies on September 30th. Dr. Meadows of the APHIS Mission staff and Dr. Williams, Chief Staff Officer of the Screwworm Eradication Program, APHIS, flew to Florida today to initiate a survey. If they find that the problem is extensive, there may be a requirement that ARS entomologists cooperate with APHIS officials in detailed Florida studies.

Items of Possible Interest to the Secretary:

ARS Research facilities may have further increased responsibilities in screwworm investigations because of a case reported in Florida on September 29.

The State Veterinarian of Florida advised Dr. M. E. Meadows of the APHIS facility at Mission, Texas that screwworm had been found in a native cow near Sebrin, Florida. APHIS officials will release 1,600,000 sterile flies on September 30th. Dr. Meadows of the APHIS Mission staff and Dr. Williams, Chief Staff Officer of the Screwworm Eradication Program, APHIS, flew to Florida today to initiate a survey. If they find that the problem is extensive, there may be a requirement that ARS entomologists cooperate with APHIS officials in detailed Florida studies.

SCREWWORM

UNITED STATES DEPARTMENT OF AGRICULTURE —— Animal and Plant Health Inspection Service

Picture Story 259

October 1972

In areas where flies are released, selected ranchers are asked to collect egg masses from wounds and hold them in special containers. Here Brown examines eggs, collected by Arturo Garza, to see if they have hatched or not. Brown will report this information back to the Mission, Texas, office so they will know whether or not the sterile flies are effective in this area. (0872A1219-8)

This year's screwworm outbreak is the worst since the Southwest Screwworm Eradication Program began in 1962. An unusually warm winter and plenty of rain aided this voracious pest in its drive northward from Mexico in an overwhelming invasion of the United States.

Under normal conditions, the U.S. Department of Agriculture prevents buildups of screwworms by rearing and releasing sexually sterile males flies. These males mate with native fertile female flies, which then lay eggs that do not hatch, preventing new

COVER: Responding to a call from a rancher in his district, Federal Livestock Inspector William Brown examines swine with infested wounds. He will collect larvae samples and show the rancher how to treat wounds. (0872A1220-5)

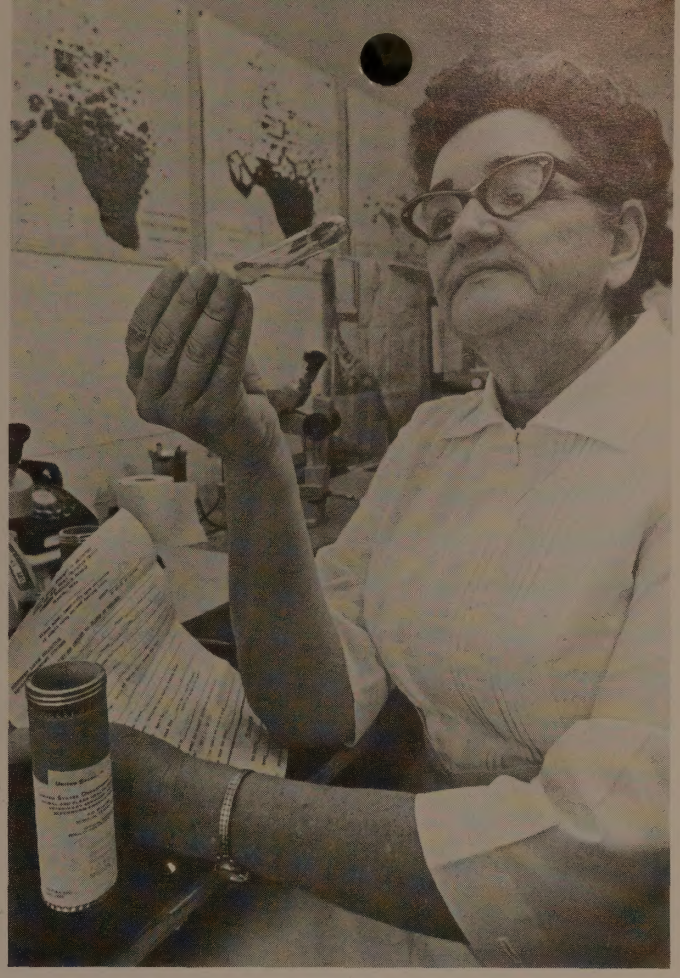
In the busy day of a livestock inspector, Brown delivers collection mailing tubes to a rancher, as well as explaining the use of an aerosol spray for livestock wounds. (0872A1219-8)

generations of screwworms. The USDA sterile fly factory in Mission, Texas, has been working at full capacity this summer producing 200 million flies a week. This, however, has not been enough to overcome this year's invasion.

To supplement USDA efforts, ranchers have been asked to cooperate by regularly checking their herds, treating all wounds, and collecting samples of worms or eggs found in wounds. Postage-paid collection kits are available from county agents, veterinarians, and livestock inspectors.

To prevent screwworm spread into the southeastern States, the USDA has issued regulations requiring certification of all livestock shipments out of the infested areas. State and Federal inspectors, and accredited veterinarians make inspections, supervise pesticide applications, and issue shipping certificates. These regulations will remain in effect from April 15 to November 30 of each year.

Cold weather will eventually push the screwworm back to the Mexican border, and here sterile screwworm flies will continue to be dropped throughout the winter.



At the Screwworm Identification Center in Mission, Texas, Mrs. Ruth McLaughlin heads up a team that has identified an average of 1,000 samples each day from June to the end of October. Positive identification is needed to determine where and how many flies to release. (0872A1233-4)

USDA regulations affect livestock shipments originating in the screwworm infested areas of Texas, Oklahoma, Puerto Rico, Arizona, California, and New Mexico. APHIS now requires that all livestock moving from these infested areas into or through the southeast portion of the U.S. be inspected, treated and certified free of screwworms within 72 hours of shipment. (0872A1219-33)

Each day of the week planes are loaded with sterile flies which are released over infested areas. Two types of planes are used; C-45's which can carry two million flies, and C-47's which carry eight million flies on each mission. (0872A1239-10)

Dr. James E. Novy breaks open a box of sterile flies and releases 2000 flies. This is what happens when the box leaves the aircraft. (0872A1233-20)

When isolated infestations occur, a large target is prepared to help aircraft spot the proper ranch. These "hot spot" infestations receive at least 100,000 flies once a week for a three week period. The established heavily infested areas receive regular releases in a pre-determined pattern. (0872A1240-28)

The Animal and Plant Health Inspection Service (APHIS) sterile screwworm rearing facility in Mission, Texas, has been rearing over 200 million sterile flies a week--a full production capability. The pupae are sterilized with radioactive Cobalt 60, and then placed in boxes (2000 to the box) for release.(0872A1229-27)

MAGAZINES AND NEWSPAPERS MAY OBTAIN 8x10 PRINTS OF THESE PHOTOGRAPHS FROM THE PHOTOGRAPHY DIVISION, OFFICE OF INFORMATION, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C. 20250. SPECIFY TITLE AND NUMBER OF THIS PUBLICATION.

During the sterilization process, canisters containing 30,000 flies are exposed to one of the six Cobalt 60 radiation sources at the rearing facility. From each canister 15 pupae are removed, hatched and mated with fertile females. The resulting eggs are checked for fertility. This test guarantees the effectiveness of the sterilization process. (0872A1228-16)

OCT 30 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~MARKET QUALITY RESEARCH DIVISION~~
~~FEDERAL CENTER BUILDING~~
~~HYATTSVILLE, MARYLAND 20782~~
National Program Staff
Plant Industry Station
Beltsville, Maryland 20705

October 26, 1972

Subject: GAO Review of Screwworm Program

To: Hugo O. Graumann, Acting Assistant Administrator
Plant and Entomological Sciences

Mr. Charles Cotton of GAO has called me about an 8-month review they are making on pest control programs. He intends to cover the screwworm program and was referred to me by Dr. Klassen, with whom I got the impression he may have discussed other programs. Mr. Cotton wants to begin this review on or soon after November 6. He said he would be at Beltsville for a couple of months after that date. He asked me to assemble some material for his use in the review. The items he listed are as follows:

1. Background research--agency, location, and amount of funding (the latter presumably for each year).

2. Reprints of the publications resulting from the research program.

3. How the control project got started, and the funding by agency.

4. Involvement with the States. I would add involvement with the Government of Mexico, which he did not mention.

5. Successes and failures of the program, in research as well as control.

6. Copies of trip reports, program evaluations, summaries of pertinent conferences, and recommendations.

7. Outlook for the future.

8. Names of APHIS officials responsible for the program of that agency.

It would seem to be a good idea to wind up with a statement of the annual losses in the Southeast when the screwworm was there and multiply that by the number of years since eradication, to show the

beneift produced. Could we then subtract the cost of eradication and show a net gain? Can we show a reduction in losses in the Southwest since the inception of the control program?

I take it for granted that we are to give full cooperation to this GAO review. I will assume the leadership in assembling the necessary information, if that is desired. It is obvious I will need some assistance from men like Drs. Knipling, Bushland, and Klassen, who have been intimately involved with the program.

L. S. Henderson

L. S. Henderson
Staff Scientist

cc:
Dr. Knipling
Dr. Bushland
Dr. Klassen
Dr. A. W. Cooper
Mr. E. A. Taylor

Screwworm Research Laboratory
P. O. Box 986
Mission, Texas 78572

November 2, 1972

Subject: Screwworm Review Papers

To: Dr. L. C. Henderson
NPS-ARS-USDA
Federal Center Building
Hyattsville, Maryland 20782

Pursuant to our telephone conversation, I am enclosing the Baumhover paper. I phoned Fargo and arranged for my former secretary, Mrs. Pepple, to send you 4-5 review papers I have written. She promised me that they would go off today.

Dr. LaChance is away from the Fargo Laboratory until Monday, but I talked to his secretary. The paper he is to give in Vienna next week is in rough draft form. Dr. LaChance is editing it at home and will have a final copy to send you on Monday.

R. C. Bushland
Acting Research Leader

Enclosure

CC: Mr. E. A. Taylor

Screwworm Research Laboratory
P. O. Box 986
Mission, Texas 78572

November 2, 1972

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To: Dr. L. C. Henderson
NPS-ARS-USDA
Federal Center Building
Hyattsville, Maryland 20782

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R. C. Bushland
Acting Research Leader

Enclosure

CC: Mr. E. A. Taylor

NOV 19 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D. C. 20250

Eat

NOV 7 1972

Subject: Screwworm Technical Work Conference at Mission, Texas, on December 6, 1972

To: H C Cox
USDA-ARS-Southern Region
New Orleans, Louisiana

We plan to hold a Technical Work Conference on the screwworm program at Mission, Texas, on December 6 at 9 a.m. This conference will cover all phases of the program including our efforts in the United States, Mexico, and Puerto Rico.

We hope that you and other research entomologists from Agricultural Research Service whom you designate can also attend.

E. E. Saulmon
Deputy Administrator

cc:
Dr. M. E. Meadows, APHIS, Mission, Texas
Mr. A. H. Baumhover, ARS, Oxford, North Carolina
Dr. R. C. Bushland, ARS, Mission, Texas
Mr. E. A. Taylor, ARS, Weslaco, Texas
Dr. Lyman Henderson, ARS, Hyattsville, Maryland

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D. C. 20250

NOV 7 1972

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We hope that you and other research entomologists from Agricultural Research Service whom you designate can also attend.

E. E. Sanimon
Deputy Administrator

cc:
Dr. M. E. Meadows, APHIS, Mission, Texas
Mr. A. H. Baumhover, ARS, Oxford, North Carolina
Dr. R. C. Bushland, ARS, Mission, Texas
Mr. E. A. Taylor, ARS, Waiaco, Texas
Dr. Lyman Henderson, ARS, Hyattsville, Maryland

NOV 21 1972

11/21/72

To: E. A. Taylor

From: W. G. Hart

Received a call from Dr. Lyman Henderson of NPS today (11/21/72) stating that he will be attending the work conference on the screwworm program at Mission on December 6th. He will leave his office on Friday, Dec. 1st and be at Kerrville on Mon. Dec. 4. He will leave Kerrville on Tues. Dec. 5 and arrive at McAllen at 5:22 pm, Dec. 5. He will attend conference on Dec. 6th and would like to go back to screwworm lab on Dec. 7th. Requested that room reservations be made for him at Holiday Inn in McAllen for nights of Dec. 5 and 6. Also requested that we notify Dr. Bushland about his itinerary. He would appreciate receiving transportation to the Mission lab while he is in the area.

His telephone no. 301-344-3924 (new number) (old no. 301-436-8685 until 11/22/72)

Room 332, North Bldg. ARC West
Beltsville, Maryland

Bill

SOUTHERN REGION
509 W. Fourth Street
Weslaco, Texas 78596

November 22, 1972

Subject: Work Conference at Mission, Texas

To: Dr. Lyman Henderson
National Program Staff
Beltsville, Maryland

I have made reservations for you at the Holiday Inn, 2000 South 10th Street, McAllen, Texas (phone: 686-1741) for the nights of December 5 and 6. The Holiday Inn has a free pick-up service from the airport to their motel. If you will call them when you arrive at the airport, they will send someone for you. I have informed Dr. R. C. Bushland of the Screwworm Research Laboratory of your visit and he asked that I inform you that he will pick you up at the motel at 8:00 am on Wednesday, December 6. We look forward to your visit in our area.

Juanita Escamilla
Secretary to E. A. Taylor

cc:
R. C. Bushland

SOUTHERN REGION
509 W. Fourth Street
Weslaco, Texas 78596

November 22, 1972

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To: Dr. Lyman Henderson
National Program Staff
Beltsville, Maryland

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Juanita Escamilla
Secretary to E. A. Taylor

cc:
R. C. Bushland

Mr. Taylor
Weslaco, Tex

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN REGION
701 LOYOLA AVENUE
P. O. BOX 53326
NEW ORLEANS, LOUISIANA 70153

NOV 22 1972

November 15, 1972

Subject: Screwworm Technical Work Conference at Mission, Texas, on December 6, 1972

To: E. E. Saulmon, Deputy Administrator, Veterinary Services, APHIS

Many thanks for your November 7 memorandum inviting me to attend the subject conference.

Unfortunately, previous commitments will prevent me from attending. I had hoped that Dr. A. W. Cooper, Deputy Administrator for the Southern Region, could attend the next Technical Work Conference but he, too, has a conflicting engagement.

In the event that he is not aware of the conference, I am notifying Dr. Lyman Henderson. In addition, I am sure that Mr. E. A. Taylor, along with Dr. R. C. Bushland and his staff, will be present.

H C Cox
Acting Associate
Deputy Administrator

cc:
E. A. Taylor, Weslaco, Texas
R. C. Bushland, Mission, Texas
L. Henderson, NPS, Beltsville, Md.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREIGN AGRICULTURAL SERVICE
WASHINGTON, D. C. 20250

MAY 3 1972

Subject: Screwworm Technical Work Conference at Mission, Texas, on December 6, 1972

To: H E Cox
ECON-ARS-Southern Region
New Orleans, Louisiana

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We hope that you and other research entomologists from Agricultural Research Service who you designate can also attend.

E. E. Sanborn
Deputy Administrator
Veterinary Services

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE NOV 27 1972

11/24/72

TO

Mr. Edgar A. Taylor

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [ ] FOR INFORMATION
- [ ] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS Apparently the attached was intended for your A. J. Graham, not our O. G. Graham.

FROM

R. O. Drummond

Kerrville

GPO : 1964 OF—742-059

FORM AD-514 (8-64)

Taylor

11-22-72

Roger:

I believe it was intended that you have this in relation to Mr. Graham

Rex

No - A.J. Graham

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 11/17/72

TO

Donald Borgeson

Administrative Officer

College Station, Texas

To Cecil Devereln

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [ ] FOR INFORMATION
- [XX] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS Re: Dr. Raymond C. Bushland

Attached returned as per your

telcon with Dr. Cox.

Wesley D. McCann

FROM

Wesley D. McCann

SRAO

NOLA

NOV 22 1972

GPO : 1964 OF—742-059

FORM AD-514 (8-64)

Donald Bergeson

Administrative Officer

College Station, Texas

Re: Dr. Raymond C. Burleigh

Attached returned as per your telecon with Dr. Cox.

Wesley T. McGann
SSAO
NOLA

NOV 22 1972

Attention
Dr. H. C. Cox
From R. C. Buckland, Mission

October 30, 1972

Subject: Screwworm Survey and Joint Work Conference in Tortola, British Virgin Islands
Tortola, B V I

To: R. C. Buckland, Acting Executive Leader
Screwworm Research Laboratory
Mission, Texas 78572

We have tentatively scheduled a screwworm survey field trip and work conference to the British Virgin Islands for the week of November 27, 1972.

We have been requested by the British Virgin Islands Government to come to Road Town to help them evaluate the status of their screwworm program. It will probably be necessary to visit several of the Islands before making any recommendations.

We are requesting authorization for foreign travel for Dr. E. F. Sauborn, Dr. H. C. King, Dr. J. L. Lovingood, Dr. M. E. Decker, Mr. A. J. Gribble, and myself. Representatives of the U.S. Air Force will also participate.

We request that you accompany the group to the British Virgin Islands to assist us in conducting the screwworm survey and in arriving at recommendations affecting the future of the screwworm program in both the British Virgin Islands and the U.S. Virgin Islands. Enclosed is a copy of an AID Form T-10, which we are sending forward for approval.

D L Wms
D. L. Williams
Chief Staff Entomologist
Screwworm Eradication

Enclosure

cc:
Dr. J. L. Wilder, APHIS, Hyattsville
Dr. H. C. King, APHIS, Hyattsville
Dr. M. E. Mendoza, APHIS, Mission, Texas
Dr. A. E. Pepatone, APHIS, San Juan, Puerto Rico

APHIS:VS:DLWilliams:mm 10/26/72 ext. 69635

NAMES OF PERSONS TO BE AUTHORIZED TO TRAVEL, TITLE, OFFICIAL STATION

1. Dr. E. E. Saulmon, Deputy Administrator, APHIS-OA
   Washington, D.C.

2. Dr. H. C. King, Regional Director-Southeast, APHIS-VS
   Hyattsville, Maryland

3. Dr. J. L. Hourrigan, Senior Staff Veterinarian, SCEE Staff
   Hyattsville, Maryland

4. Dr. D. L. Williams, Chief Staff Veterinarian, Screwworm Eradication,
   SCEE Staff, Hyattsville, Maryland

5. Dr. M. E. Meadows, Veterinarian in Charge, APHIS-VS
   Mission, Texas

6. Mr. A. J. Graham, Entomologist in Charge, Methods Development,
   APHIS-VS, Mission, Texas

REQUEST FOR TRAVEL AUTHORIZATION [X] OR AMENDMENT [ ]

DATE: October 26, 1972

1. AGENCY: USDA, APHIS, Veterinary Services

2. NAME OF PERSON TO BE AUTHORIZED TO TRAVEL: See attached list.

3. TITLE: See attached list.

4. OFFICIAL STATION: See Attached List.

5. TRAVEL TO BEGIN ON OR ABOUT: November 27, 1972

6. CHANGE OR ON ABOUT: December 1, 1972

8. PER DIEM ALLOWANCE RECOMMENDED: Standard USDA rate within continental United States and maximum rates allowable by SGTR outside continental United States.

10. ITINERARY: Official duty station to various points in the British Virgin Islands, such as: Tortola, Anegada, Jost Van Dyke, and Virgin Gorda.

11. PURPOSE OF TRIP: At the request of the British Virgin Islands Government, it is necessary to go to the British Virgin Islands for the purpose of carrying out ecological studies ~~[illegible]~~ to determine whether screwworms are still present among the livestock and wildlife of these Islands. After field observations are completed, discussions will be held with representatives of the B.V.I. and the U.S.A.F. to make decisions about the screwworm status of these Islands and the future program operations as they affect the B.V.I. and the United States.

12. MODE OF TRAVEL: [X] COMMON CARRIER [ ] GOVERNMENT TRUCK* [ ] EXTRA FARE AIRPLANE* [ ] PRIVATELY OWNED AUTOMOBILE [ ] GOVERNMENT VEHICLE

13. MILEAGE ALLOWANCE FOR TRAVEL BY PRIVATELY OWNED AUTOMOBILE RECOMMENDED IF MODE OF TRANSPORTATION BEING MADE ADVANTAGEOUS TO THE GOVERNMENT: (a) Cents per mile for travel from official station (b) Cents per mile for travel entirely within limits of official station.

14. AUTHORITY REQUESTED TO EMPLOY VETERINARY ASSISTANTS AS INDICATED: [ ] SUBJECT TO CIVIL SERVICE RULES AND DEPARTMENT REGULATIONS. [ ] UNSKILLED LABORERS NOT OVER DAYS AND OTHER ASSISTANTS NOT OVER DAYS IN ANY ONE YEAR.

15. [ ] AUTHORITY REQUESTED TO PURCHASE NECESSARY SUPPLIES AND OBTAIN NECESSARY MEDICAL TREATMENT.

16. [ ] THE CHANGE OF OFFICIAL STATION INDICATED IS IN THE INTEREST OF THE GOVERNMENT AND NOT PRIMARILY FOR THE CONVENIENCE OR BENEFIT OF THE EMPLOYEE OR AT HIS REQUEST.

17. AUTHORITY REQUESTED AS INDICATED IN CONNECTION WITH CHANGE OF OFFICIAL STATION: [ ] TRANSPORTATION OF HOUSEHOLD GOODS AND PERSONAL EFFECTS. [ ] TRANSPORTATION OF EMPLOYEE'S IMMEDIATE FAMILY, AS DESCRIBED IN SPACE BELOW. [ ] MILEAGE FOR USE OF PRIVATELY OWNED AUTOMOBILE IN ACCORDANCE WITH DETERMINATION IN PARAGRAPH 13 ABOVE, FOR TRANSPORTATION OF EMPLOYEE AND/OR MEMBERS OF HIS IMMEDIATE FAMILY AS NOTE DESCRIBED BELOW.

Cents per mile when one individual travels alone. Cents per mile when two or more persons travel together.

18. EMPLOYEE MILEAGE AUTHORITY REQUESTED	19. IDENTIFICATION CARD AUTHORIZED	20. MOTOR VEHICLE OPERATOR'S PERMIT REQUESTED	21. ALLOTMENT REQUESTED OF	22. ESTIMATED COST
[ ]	[ ]	[ ]	$	$

23. QUANTITY OF TRANSPORTATION REQUESTED-REFERRED: 24. AUTHORIZATION AND PROJECT:

25. SPECIAL PROVISIONS OR REMARKS:

The U.S. Air Force, which is cooperating in this work by transporting sterile flies from Mission to Puerto Rico and releasing them in Air Force planes, strongly urges that APHIS personnel participate in this survey to evaluate work done to date.

SIGNATURE AND TITLE OF APPROVING OFFICER: G. V. Peacock

SIGNATURE AND TITLE OF RECOMMENDING OFFICER:

*Fill out blanks above and show justification required by P. AR-552

ARS FORM T-13
FEB 1965

DEC 11 1972

National Program Staff
Beltsville, Maryland 20705

December 5, 1972

Subject: Proprietary Pesticides for Use in the Screwworm Program

To: R. C. Bushland
USDA, ARS
Post Office Box 986
Mission, Texas 78572

We have received a list of proprietary products currently registered with the Environmental Protection Agency for use against screwworms from Dr. Donald L. Williams, Chief Staff Veterinarian, Screwworm Eradication, APHIS. I believe this list was forwarded to you earlier by Dr. J. L. Hourrigan for comment. Dr. Graham responded to Dr. Hourrigan in a letter of August 4 and indicated the compounds were effective.

Since the Department is heavily committed in the screwworm program, I believe it would be most beneficial to know which of these products are the most effective as a screwworm treatment. Therefore, I would appreciate your suggestions as to the three most efficacious products in order of priority.

The list excludes the use of products containing lindane or those that contain less than 5% ronnel. I have checked with the Environmental Protection Agency on these products and they inform me that products containing pine oil such as Franklin EQ335 smear have been restricted for use. However, other products containing lindane without pine oil are still registered. EPA also informed me that the products containing 2.5% ronnel will in effect be 5% ronnel when the propellant evaporates.

In making the selection of the top three chemicals, I would not overlook the ones that are not included in the list of approved pesticides, if they rank higher but, rather add them to the three selected from the permitted list.

I would also appreciate any information you may have on pesticides that are not currently registered for use against screwworms, but which may show promise as being more efficacious then those products on the enclosed list. Pesticides not registered could be used in an experimental field trial, such as the Puerto Rican screwworm work. However, if the product is to be used extensively we would have to obtain an experimental use permit.

Paul H. Schwartz, Jr.

Paul H. Schwartz, Jr.
Staff Specialist
Pesticides

cc:
E. A. Taylor
D. L. Williams
W. Klassen